Unit 5 Trigonometry 11/21/14

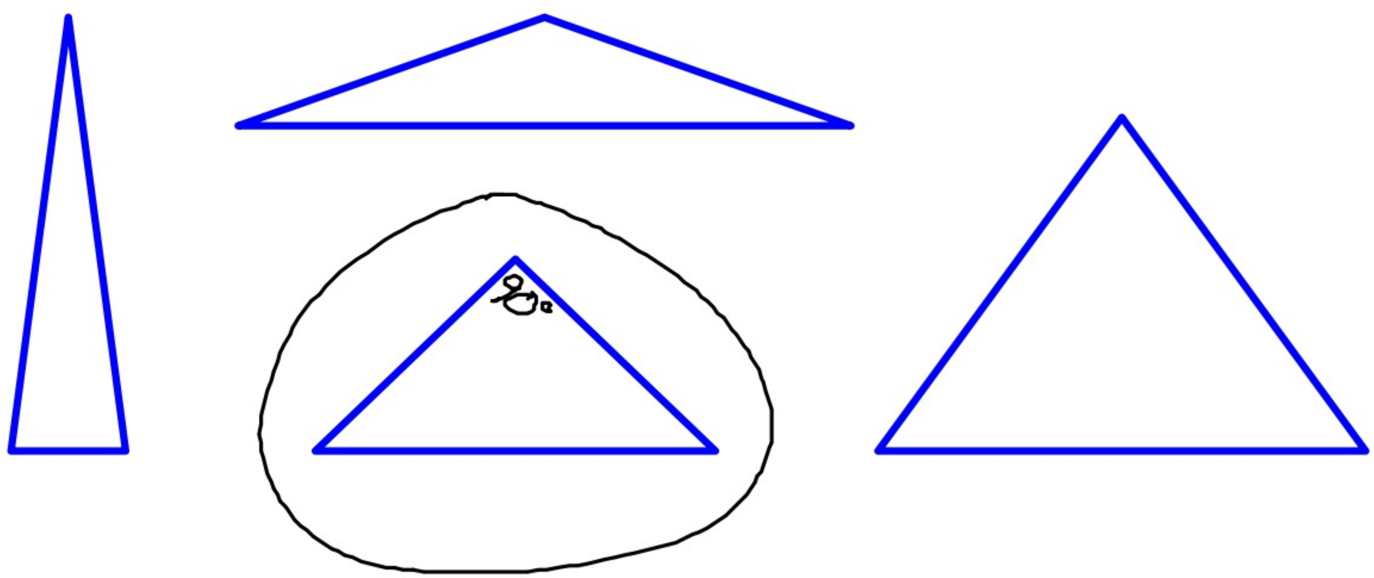
Please wrap up your Unit 3 test. (15 min)

5.1 Right Triangles 11/21/14

What are right triangles?

A triangle with one right angle.

right angle - measures 90°



5.1 Right Triangles 11/21/14

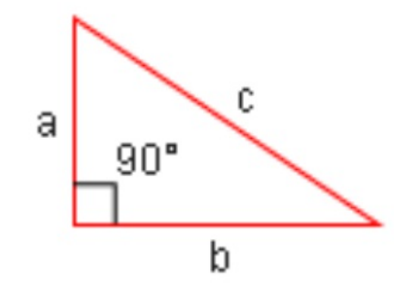
IWBAT understand the relationships between the sides and angles of right triangles known as trigonometry.

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry. I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.1 Right Triangles

11/21/14

Parts of a right triangle



A right triangle

Legs - (a + b) the two sides of the 90° angle, shorter than the 3rd side

Hypoteneuse - (c) the longest side, across from the 90° angle (opposite)

Right angle - measures 90°

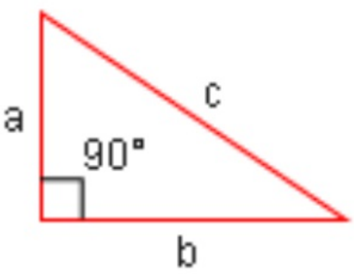
Acute angles - measure < 90°

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles

11/21/14

Pythagorean Theorem



A right triangle

$$a^2 + b^2 = c^2$$

The sum of the square of the legs is equal to the square of the hypoteneuse.

Pythagorean triple - Sets of three integers that satisfy the Pythagorean theorem

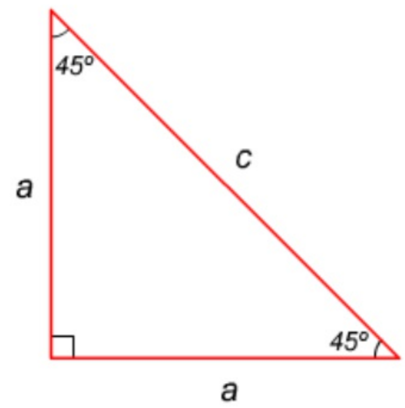
e.g. 3-4-5 right triangle

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles

11/21/14

Special right triangles: 45-45-90



$$a^2+b^2=c^2$$

$$a^2+a^2=c^2$$

$$\frac{2a^2}{2}=\frac{c^2}{2}$$

$$\sqrt{a^2}=\sqrt{\frac{c^2}{2}}$$

$$a=\frac{\sqrt{c^2}}{\sqrt{2}}$$

$$a=\frac{c}{\sqrt{2}}=\frac{1}{\sqrt{2}}c$$

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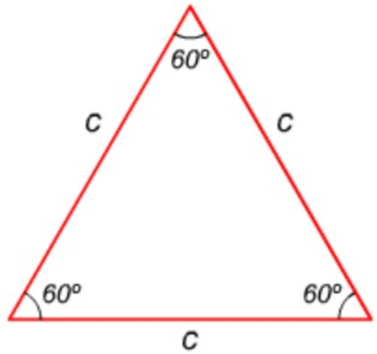
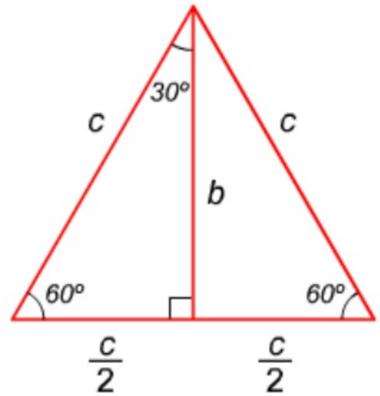
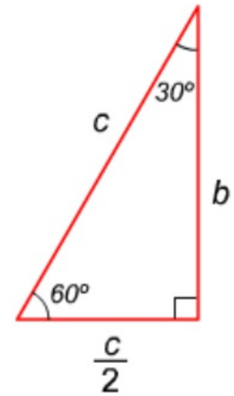
5.1 Right Triangles 11/21/14

Special triangles: 30-60-90







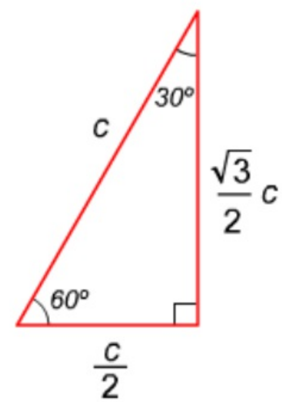
$$\left(\frac{c}{2}\right)^2 + b^2 = c^2$$

$$\cancel{\frac{c^2}{2^2}} + b^2 = c^2$$

$$\cancel{-\frac{c^2}{2^2}} \qquad -\frac{c^2}{2^2}$$

$$\sqrt{b^2} = \sqrt{\frac{3}{4}c^2}$$

$$b = \frac{\sqrt{3}}{2}c$$



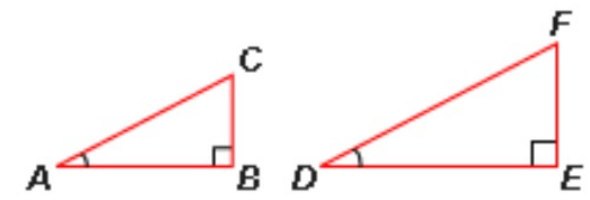
$$b^2 = 1c^2 - \frac{1}{4}c^2 = \frac{3}{4}c^2$$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 11/21/14

Similar triangles

have the same angle measures, but different side lengths



These two triangles are similar but not congruent.

$\triangle ABC \sim \triangle DEF$

$\angle A \cong \angle D$

$\angle B \cong \angle E$

$\angle C \cong \angle F$

$\overline{AB} \sim \overline{DE}$

$\overline{BC} \sim \overline{EF}$

$\overline{AC} \sim \overline{DF}$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 11/21/14

In one sentence, explain what makes two triangles similar, but not congruent.

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 12/01/14

Solve problems using Pythagorean theorem.

P3

45-45-90

1) a = 3, b = 4, c = ?
2) a = 4, b = 4, c = ?
3) a = ?, b = 5, c = 8

$a^2+b^2=c^2$

1) $3^2+4^2=c^2$

$9+16=c^2$

$\sqrt{25}=\sqrt{c^2}$

$5=c$

2) $4^2+4^2=c^2$

$16+16=c^2$

$\sqrt{32}=\sqrt{c^2}$

$\sqrt{32}=c$

$32 \to 4 \cdot 8$, $8 \to 4 \cdot 2$

$4\sqrt{2}=c$

3) $a^2+5^2=8^2$

$a^2+25=64$

$-25 \quad -25$

$\sqrt{a^2}=\sqrt{39}$

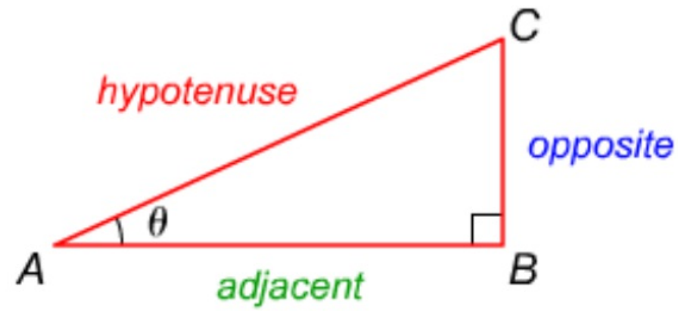
$a=\sqrt{39}$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles

12/01/14

Recall SOHCAHTOA



$$\sin\theta = \frac{Opp}{Hyp}$$

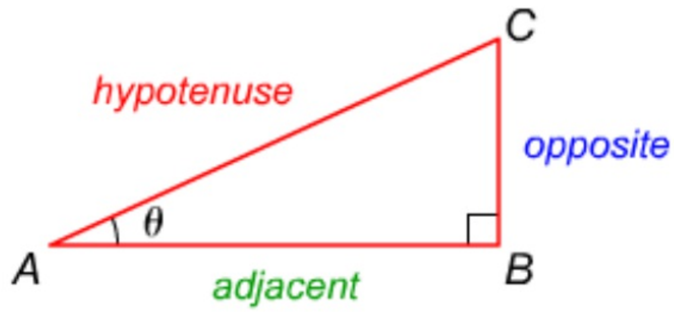
$$\cos\theta = \frac{Adj}{Hyp}$$

$$\tan\theta = \frac{Opp}{Adj}$$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 12/01/14

Three new ratios



$$\csc(\theta) = \frac{Hyp}{Opp}$$

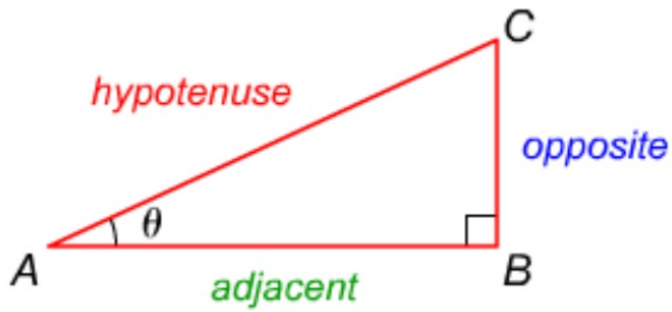
$$\sec(\theta) = \frac{Hyp}{Adj}$$

$$\cot(\theta) = \frac{Adj}{Opp}$$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 12/01/14

The six important trigonometric ratios:



Summary:

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \csc\theta = \frac{\text{hypotenuse}}{\text{opposite}} = \frac{1}{\sin\theta}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}} = \frac{1}{\cos\theta}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\text{adjacent}}{\text{opposite}} = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$$

These ratios are the same for all triangles with interior angle θ (similar triangles).

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

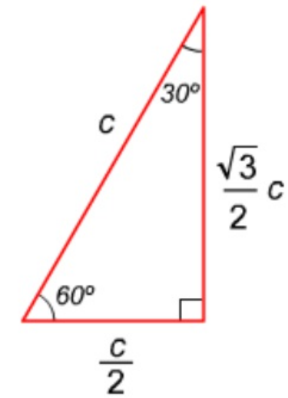
5.1 Right Triangles 12/01/14

Trigonometric functions:
sine, cosine, tangent, secant, cosecant, and cotangent

Fill in the table without using a calculator.

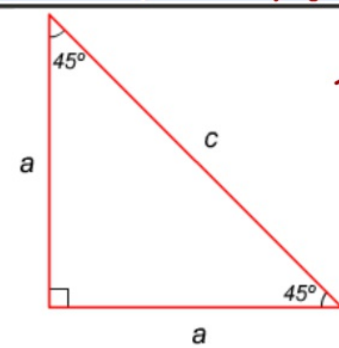
Common Values of Trigonometric Functions

	30°	45°	60°
sinθ	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
cosθ	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
tanθ	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$
cscθ	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$
secθ	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2
cotθ	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$



45-45-90

$$a = \frac{c}{\sqrt{2}} = \frac{1}{\sqrt{2}}c$$



$$\frac{1}{2} \div \frac{\sqrt{3}}{2} = \frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles

12/01/14

What patterns do you notice?

	30°	45°	60°
$\sin\theta$	$\frac{1}{2}$	$\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
$\cos\theta$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$	$\frac{1}{2}$
$\tan\theta$	$\boxed{\frac{1}{\sqrt{3}}}$	1	$\sqrt{3}$
$\csc\theta$	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$
$\sec\theta$	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2
$\cot\theta$	$\sqrt{3}$	1	$\boxed{\frac{1}{\sqrt{3}}}$

$$\sin(\theta) = \cos(90-\theta)$$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

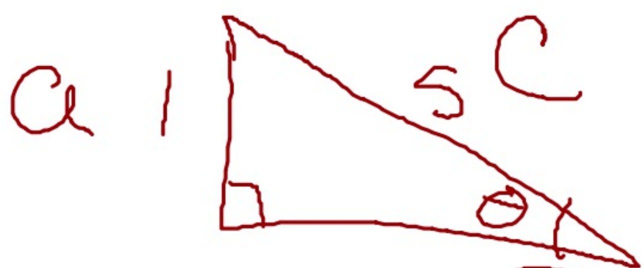
5.1 Right Triangles 12/01/14

Given sin(θ) = 1/5, calculate the other five trig. functions.

$\sin(\theta) = \frac{1}{5}$ $\qquad$ $\csc(\theta) = \frac{5}{1} = 5$

$\cos(\theta) = \frac{2\sqrt{6}}{5}$ $\qquad$ $\sec(\theta) = \frac{5}{2\sqrt{6}}$

$\tan(\theta) = \frac{1}{2\sqrt{6}}$ $\qquad$ $\cot(\theta) = \frac{2\sqrt{6}}{1} = 2\sqrt{6}$



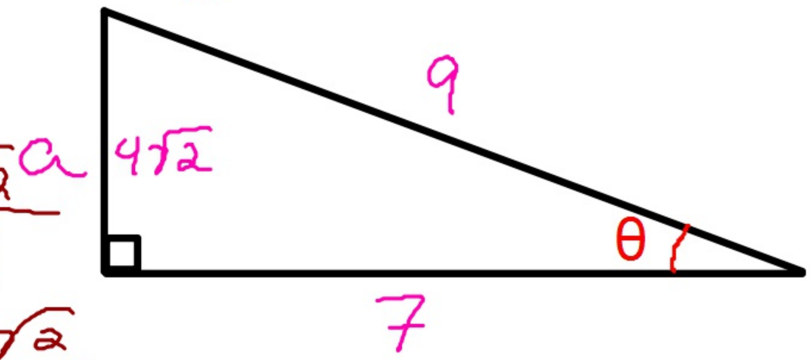
$b \quad \sqrt{24} = 2\sqrt{6}$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 12/02/14

Evaluate the five remaining trigonometric ratios for this right triangle.

$$\cos(\theta) = \frac{7}{9}$$



$a^2 + 7^2 = 9^2$

$a^2 + 49 = 81$

$-49 \quad -49$

$\sqrt{a^2} = \sqrt{32}$

$a = 4\sqrt{2}$

$\sin(\theta) = \frac{4\sqrt{2}}{9}$

$\tan(\theta) = \frac{4\sqrt{2}}{7}$

$\csc(\theta) = \frac{9}{4\sqrt{2}}$

$\sec(\theta) = \frac{9}{7}$

$\cot(\theta) = \frac{7}{4\sqrt{2}}$

IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

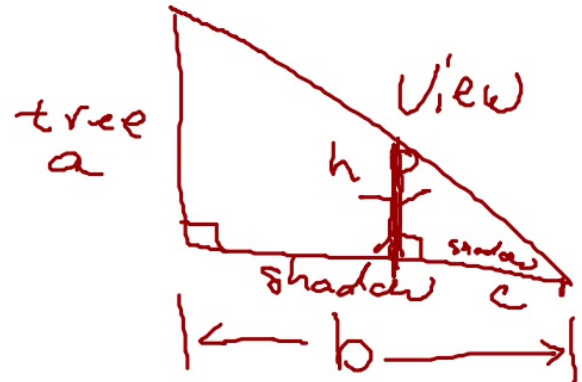
5.1 Right Triangles 12/02/14

Suppose you want to know the height of a tree on your property, but you are afraid of heights and do not wish to climb the tree to measure it.

You do notice, however, that the sun is casting a shadow of the tree. How can your understanding of trigonometry and right triangles help you?

Pythagorean theorem

$$\frac{a}{b} = \frac{h}{c}$$ Similar triangles



IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

5.1 Right Triangles 12/02/14

At a point 25 feet from the base of the tree you measure the angle from the ground to the top of the tree to be 62 degrees. How tall is the tree?

$$\frac{a}{25} = \frac{h}{c}$$

$$25 \times 12 = 300$$

$$h = 65''$$

$$\tan(62) = \frac{65}{c}$$

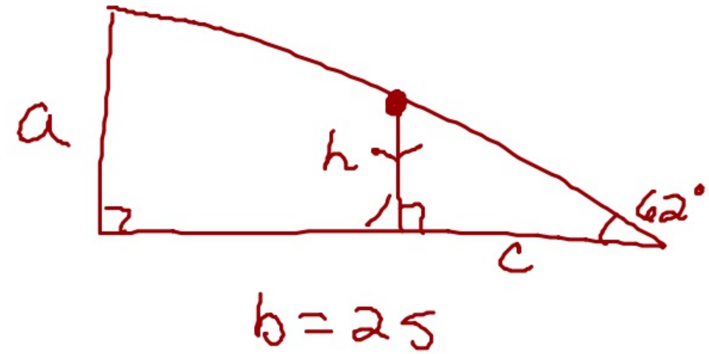
$$c = \frac{65}{\tan(62)}$$

$$c = 59.2''$$

$$\frac{a}{300} = \frac{65}{59.2}$$

$$\frac{300(65)}{59.2} = a = 329.4''$$

$$a = 27.45'$$



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5.1 Right Triangles 12/02/14

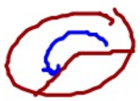
Vocabulary Appendix A.2
Practice 5.1.2
Apex quiz 5.1.3

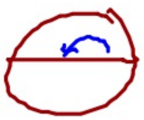
IWBAT explore the Pythagorean theorem for right triangles and characteristics of special right triangles, evaluate key trigonometric ratios for right triangles, and solve problems using right triangle trigonometry.

Identify and classify different types of angles by their measure.


acute - Measures $< 90^\circ$


obtuse - Measures $> 90^\circ$ and $< 180^\circ$


reflex - Measures $> 180^\circ$ and $< 360^\circ$


straight - Measures 180°


zero - Measures 0°

5.2 Angles and Radians 12/02/14

IWBAT

- Convert angles between degree-minute-second (DMS) and decimal forms,
- Convert between degrees and radians, and
- Calculate arc lengths.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.2 Angles and Radians 12/02/14

Decimal notation

$$25.19°$$

Degrees - minutes - seconds (DMS)

$$25° \, 11' \, 24''$$

One degree = 60 minutes

$$1° = 60'$$

One minute = 60 seconds

$$1' = 60''$$

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

Converting from decimal notation to DMS notation

$$25.19° = 25° 11' \ 24''$$

$$.19° * \frac{60'}{1°} = 11.4'$$

$$0.4' * \frac{60''}{1'} = 24''$$

$$25° + 11' + 24'' = 25° 11' 24''$$

$12,35°$ $\quad 12°$ $\quad 12° \ 21' \ 0''$

$.35 \times 60 = 21'$

$63.03°$ $\quad 63°$ $\quad 63° \ 1' 48''$

$.03 \times 60 = 1,8'$ $\quad 1'$

$.8 \times 60 = 48''$

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians 12/02/14

Converting from DMS notation to decimal notation

$$25°11'24'' = 25° + 11' + 24''$$

60 minutes per degree => one degree per 60 minutes

60 seconds per minute * 60 minutes per degree =
3600 seconds per degree => one degree per 3600 seconds

$$25° + 11' + 24'' = 25° + \frac{11}{60} + \frac{24}{3600}$$

$$25° + 0.1833° + 0.0067° = 25.19°$$

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians

12/02/14

Exit Ticket

Convert to or from DMS notation.

$47.32°$ $\qquad\qquad$ $62°12'3''$

$47°19'12''$ $\qquad\qquad$ $62.20°$

12/03/14

Warm-up

Do the conversion you did not do for your exit ticket.

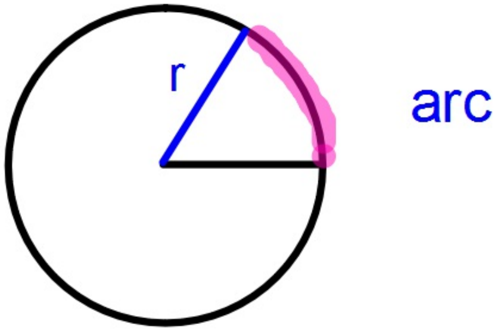
IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

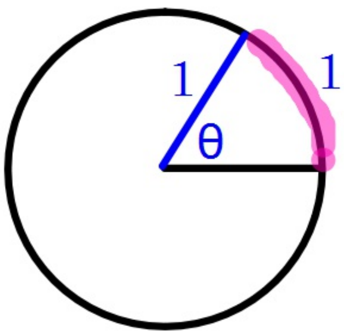
5.2 Angles and Radians 12/03/14

Radians

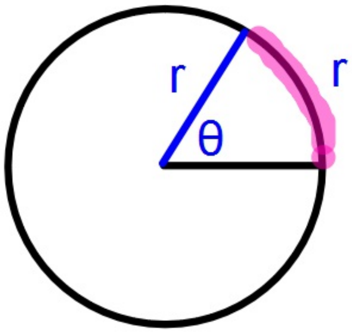
radians:

Units of angular measure determined by the condition:
The central angle of one radian in a circle of radius 1 produces an arc of length 1.





θ =1 radian

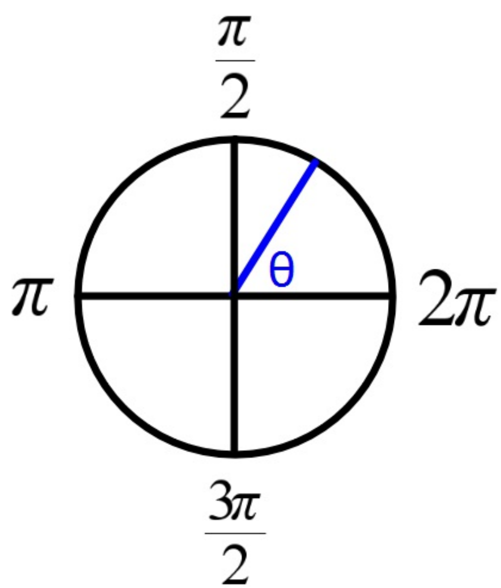


θ =1 radian

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians 12/03/14

Radians



$$1\text{radian} = \frac{180^\circ}{\pi} \approx 57.3^\circ$$

$$\text{radians} = \text{degrees} * \frac{\pi}{180^\circ}$$

$$\text{degrees} = \text{radians} * \frac{180^\circ}{\pi}$$

Convert 60 degrees to radians.

$$\cancel{60^\circ} \times \frac{\pi}{{}_3\cancel{180^\circ}} = \frac{\pi}{3}$$

Convert 3π/4 radians to degrees.

$$\frac{3\cancel{\pi}}{\cancel{4}} \times \frac{\overset{45}{\cancel{180^\circ}}}{\cancel{\pi}} = 135^\circ$$

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians

12/03/14

Practice

$$rad = deg \cdot \frac{\pi}{180°}$$

$$deg = rad \cdot \frac{180°}{\pi}$$

Measure in radians	Measure in degrees
0	0
π/6	30°
π/4	45°
π/3	60°
π/2	90°
2π/3	120°
π	180°
5π/4	225°
3π/2	270°
11π/6	330°
2π	360°

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians 12/03/14

Know which units you are using: check your calculator

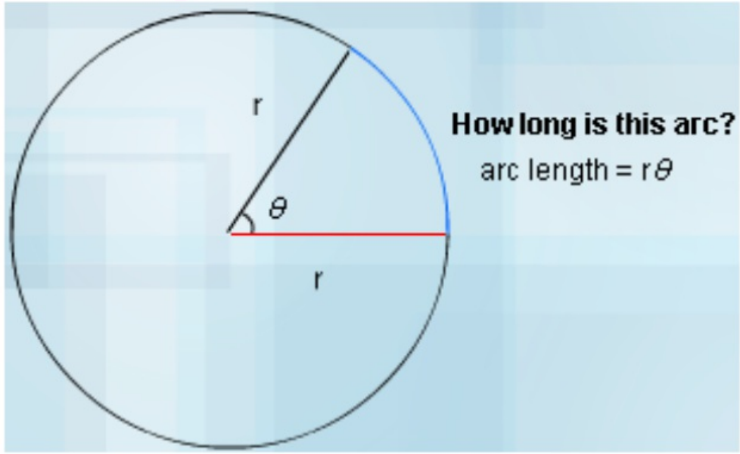
2ND MODE

Radian Degree

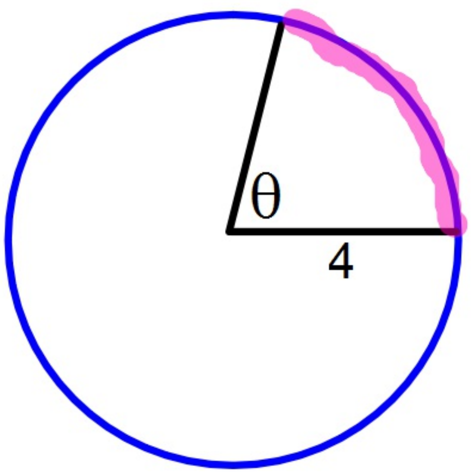
IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians 12/03/14

Arc Length



r · theta



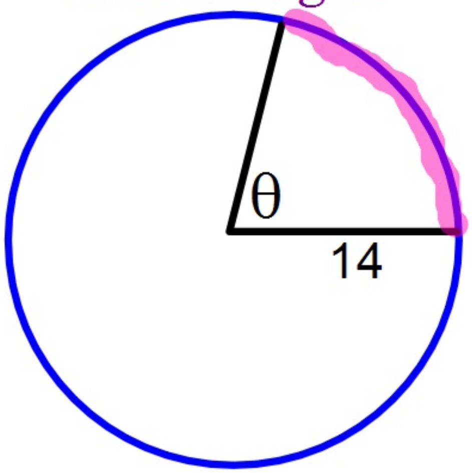
$\theta = \frac{3\pi}{8}$ How long is the arc?

$\cancel{4}^{1}\left(\frac{3\pi}{\cancel{8}_{2}}\right) = \frac{3\pi}{2}$

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians 12/03/14

Arc Length



$\theta = 63^\circ$ How long is the arc?

$$\overset{7}{\cancel{63}}\cancel{^\circ} \cdot \frac{\pi}{\underset{\underset{10}{\cancel{20}}}{\cancel{180}}} \cdot \overset{7}{\cancel{14}} = \frac{49\pi}{10}$$

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.2 Angles and Radians 12/03/14

Vocabulary Appendix A.2
Practice 5.2.2
Apex quiz 5.2.3

IWBAT convert angles between degree-minute-second (DMS) and decimal forms, convert between degrees and radians, and calculate arc lengths.

5.3 Trigonometric Ratios & the Unit Circle 12/04/14

Convert angles between degree-minute-second (DMS) and decimal forms.

$26° 15' 22''$

$26 + \frac{15}{60} + \frac{22}{3600} =$

$26.26°$

$135.27°$

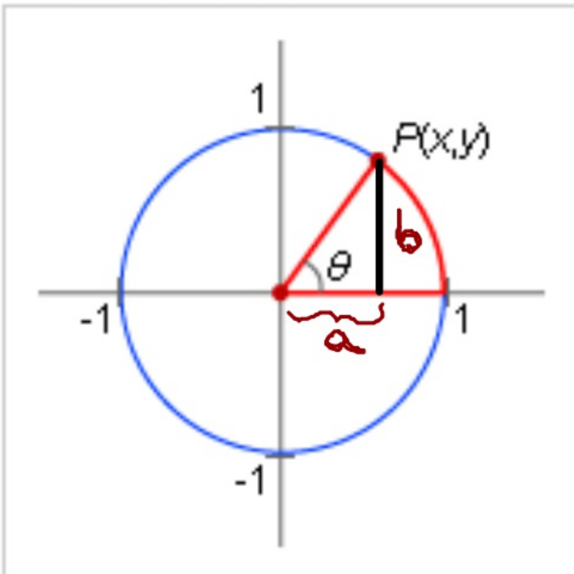
27×60

$135° 16' 12''$

5.3 Trigonometric Ratios & the Unit Circle 12/04/14

Determine if a point is on the unit circle by using the Pythagorean theorem.

Unit Circle



$a = x \quad \cos(\theta) = x$

$b = y \quad \sin(\theta) = y$

$\tan(\theta) = \frac{y}{x}$

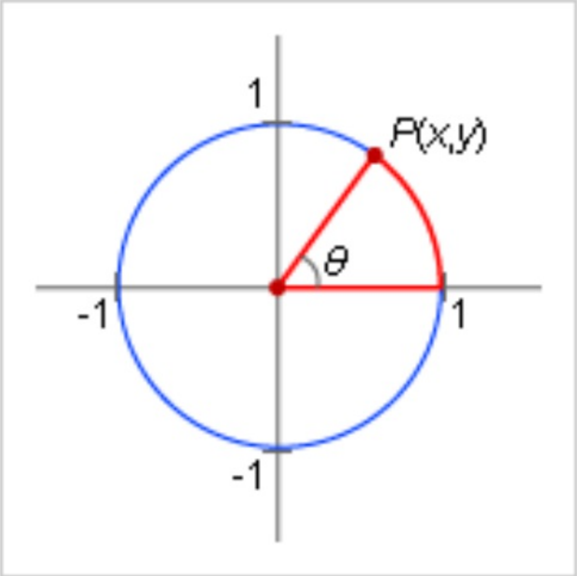
Trig. Ratios for the Unit Circle

$\sin\theta = y$		
$\cos\theta = x$		undef.
$\tan\theta = \frac{y}{x}$	(when $x \neq 0$)	90° 270°
$\csc\theta = \frac{1}{y}$	(when $y \neq 0$)	0° 180°
$\sec\theta = \frac{1}{x}$	(when $x \neq 0$)	90° 270°
$\cot\theta = \frac{x}{y}$	(when $y \neq 0$)	0° 180°

5.3 Trigonometric Ratios & the Unit Circle 12/04/14

Determine if a point is on the unit circle by using the Pythagorean theorem.

Unit Circle



Equation of the Unit Circle

$$x^2 + y^2 = 1$$

$$\cos^2(\theta) + \sin^2(\theta) = 1$$

$\div \cos^2(\theta)$ $$1 + \tan^2(\theta) = \frac{1}{\cos^2(\theta)}$$

$\div \sin^2(\theta)$ $$\cot^2(\theta) + 1 = \frac{1}{\sin^2(\theta)}$$

5.3 Trigonometric Ratios & the Unit Circle 12/04/14

Determine if a point is on the unit circle by using the Pythagorean theorem.

Summary

Equation of unit circle:

$$x^2 + y^2 = 1$$

Pythagorean theorem:

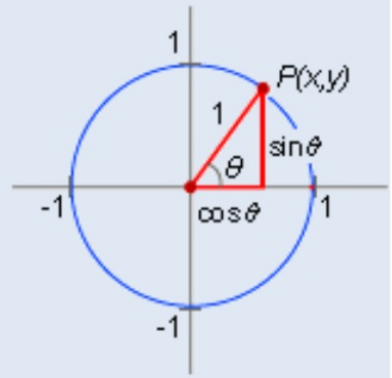
$$x^2 + y^2 = 1$$

Pythagorean identities:

$$\sin^2\theta + \cos^2\theta = 1$$

$$1 + \tan^2\theta = \sec^2\theta$$

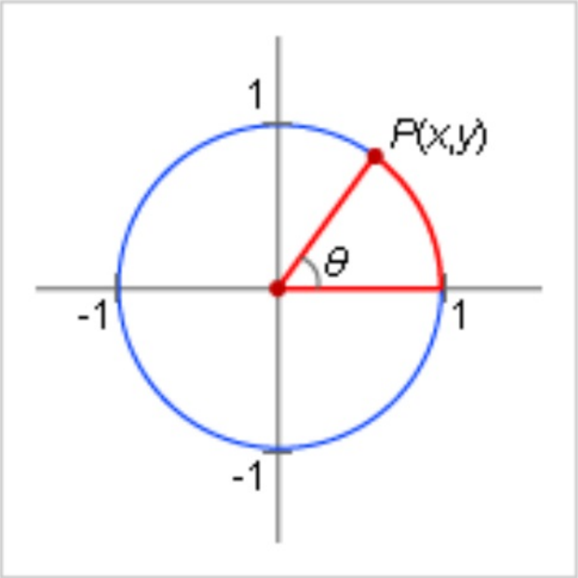
$$1 + \cot^2\theta = \csc^2\theta$$



5.3 Trigonometric Ratios & the Unit Circle 12/04/14

Determine if a point is on the unit circle by using the Pythagorean theorem.

Unit Circle



θ (degrees)	θ (radians)	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$
0°	0	0	1	0	undef.	1	undef.
90°	$\frac{\pi}{2}$	1	0	undef.	1	undef.	0
180°	π	0	-1	0	undef.	-1	undef.
270°	$\frac{3\pi}{2}$	-1	0	undef.	-1	undef.	0

5.3 Trigonometric Ratios & the Unit Circle 12/04/14

IWBAT

- Know and apply the definitions of the six trigonometric functions based on the unit circle,
- Know the angles along the unit circle that correspond to 45-45-90 and 30-60-90 triangles (in both radians and degrees) and the coordinates of their corresponding terminal points,
- Solve trigonometric functions for these special angles within the first quadrant, and
- Use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

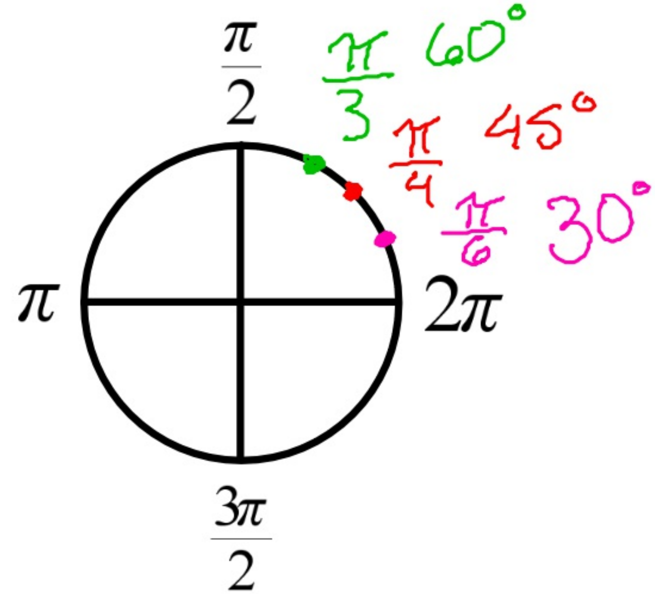
I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.3 Trigonometric Ratios & the Unit Circle 12/04/14

Label the locations of these values on the circle:

$\frac{\pi}{4}$ $\frac{\pi}{3}$

$\frac{\pi}{6}$



Calculate the degree measure for each value plotted.

$$\frac{\cancel{\pi}}{\cancel{3}} \cdot \frac{\overset{60}{\cancel{180}}°}{\cancel{\pi}} = 60°$$

$$\frac{\cancel{\pi}}{\cancel{4}} \cdot \frac{\overset{45}{\cancel{180}}°}{\cancel{\pi}} = 45°$$

IWBAT know and apply the definitions of the six trigonometric functions based on the unit circle and know the angles along the unit circle that correspond to 45-45-90 and 30-60-90 triangles (in both radians and degrees) and the coordinates of their corresponding terminal points.

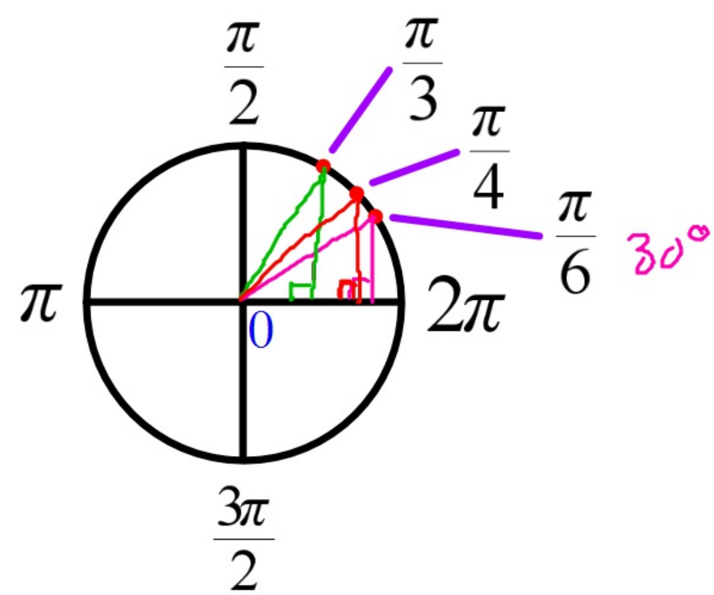
5.3 Trigonometric Ratios & the Unit Circle 12/04/14

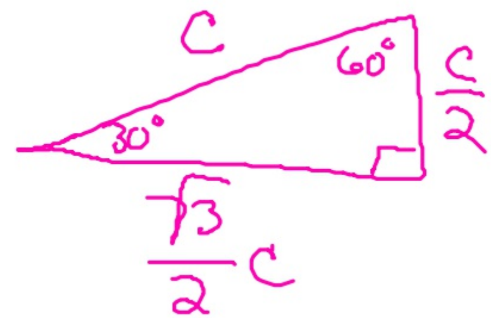
Locate the (x,y) coordinates for these points.

$\frac{\pi}{4}$ $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$

$\frac{\pi}{3}$ $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

$\frac{\pi}{6}$ $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$





IWBAT know and apply the definitions of the six trigonometric functions based on the unit circle and know the angles along the unit circle that correspond to 45-45-90 and 30-60-90 triangles (in both radians and degrees) and the coordinates of their corresponding terminal points.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

Convert between degrees and radians.

$$\frac{5\pi}{4}$$

$$\frac{5\cancel{\pi}}{\cancel{4}} \cdot \frac{\overset{45}{\cancel{180}}^{\circ}}{\cancel{\pi}}$$

$$5 \cdot 45^{\circ} = 225^{\circ}$$

$$280^{\circ}$$

$$\underset{14}{\cancel{280}}^{\circ} \cdot \frac{\pi}{\underset{9}{\cancel{180}}} = 14\pi/9$$

IWBAT solve trigonometric functions for these special angles within the first quadrant, and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

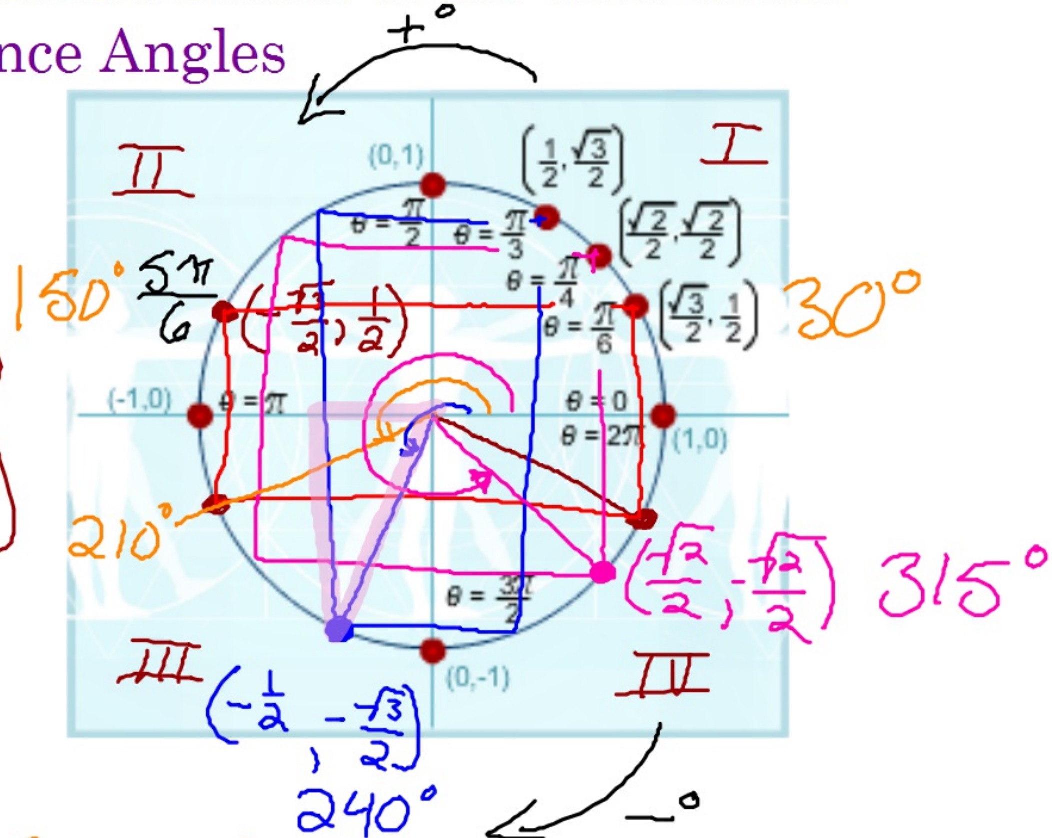
Reference Angles

QI (x, y)

QII $(-x, y)$

QIII $(-x, -y)$

QIV $(x, -y)$



$\frac{6\pi}{6} - \frac{\pi}{6}$

$180° - 30° = 150°$

Interactive graph: Apex 5.3.1 p. 10

IWBAT know and apply the definitions of the six trigonometric functions based on the unit circle and know the angles along the unit circle that correspond to 45-45-90 and 30-60-90 triangles (in both radians and degrees) and the coordinates of their corresponding terminal points.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

QI Give the (x,y) coordinates for these points, and name the special triangle with which they are associated.

$\frac{\pi}{4}$ $\left(\frac{1}{\sqrt{2}}, \frac{\sqrt{2}}{2}\right)$ $45°$ 45-45-90

$\frac{\pi}{3}$ $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ $60°$ 30-60-90

$\frac{\pi}{6}$ $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ $30°$ 30-60-90

IWBAT solve trigonometric functions for these special angles within the first quadrant and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

Show that the point $\left(\frac{7}{25}, \frac{24}{25}\right)$ is on the unit circle.

IWBAT solve trigonometric functions for these special angles within the first quadrant, and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

What is the reference angle for $\frac{11\pi}{6}$?
Explain your thinking.

IWBAT solve trigonometric functions for these special angles within the first quadrant, and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

If the point $\left(-\frac{4}{5}, y\right)$ lies on the unit circle and P is in the third quadrant, what is y? Explain.

IWBAT solve trigonometric functions for these special angles within the first quadrant, and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

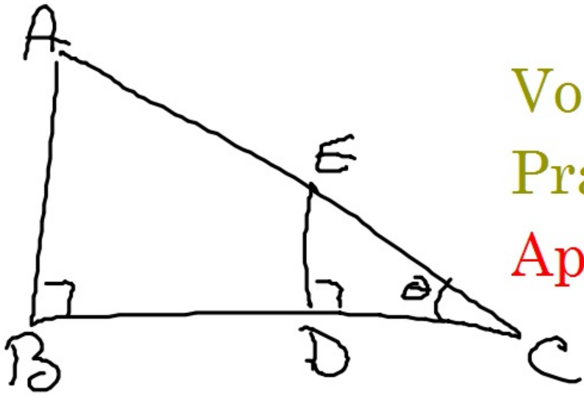
5.3 Trigonometric Ratios & the Unit Circle 12/05/14

What are the coordinates of the terminal point determined by $\theta = \frac{7\pi}{6}$?

IWBAT solve trigonometric functions for these special angles within the first quadrant, and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

5.3 Trigonometric Ratios & the Unit Circle 12/05/14

Vocabulary for Word Wall



Vocabulary Appendix A.2

Practice 5.3.2

Apex quiz 5.3.3

IWBAT know and apply the definitions of the six trigonometric functions based on the unit circle, know the angles along the unit circle that correspond to 45-45-90 and 30-60-90 triangles (in both radians and degrees) and the coordinates of their corresponding terminal points, solve trigonometric functions for these special angles within the first quadrant, and use reference angles to solve trigonometric functions for these special angles within the second, third, and fourth quadrants.

Determine if a point is on the unit circle by using the Pythagorean theorem.

Show that the point $\left(\frac{7}{25}, \frac{24}{25}\right)$ is on the unit circle.

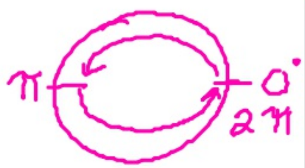
$$\left(\frac{7}{25}\right)^2 + \left(\frac{24}{25}\right)^2 = \frac{49}{625} + \frac{576}{625} = \frac{625}{625} = 1 \quad (\pi = 180^\circ)$$

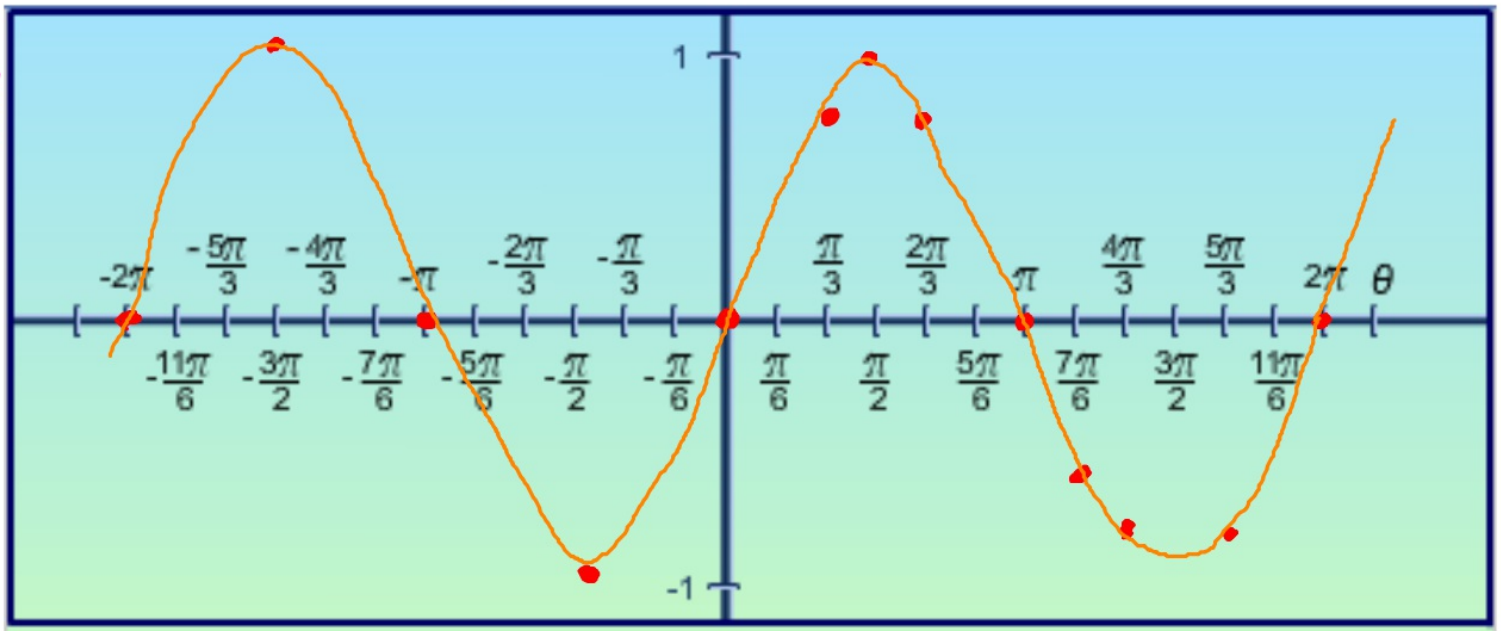
$$x^2 + y^2 = r^2 \qquad r = 1$$

Use critical points to sketch the graphs of the functions sine and cosine.

sinusoids - a family of curves based on the graph of sine

sin(θ) = sin(x)





θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
sin θ	0		.866	1	.866		0	-0.5	-.866		-.866		0

5.4 Graphs of Sine & Cosine 12/08/14

IWBAT

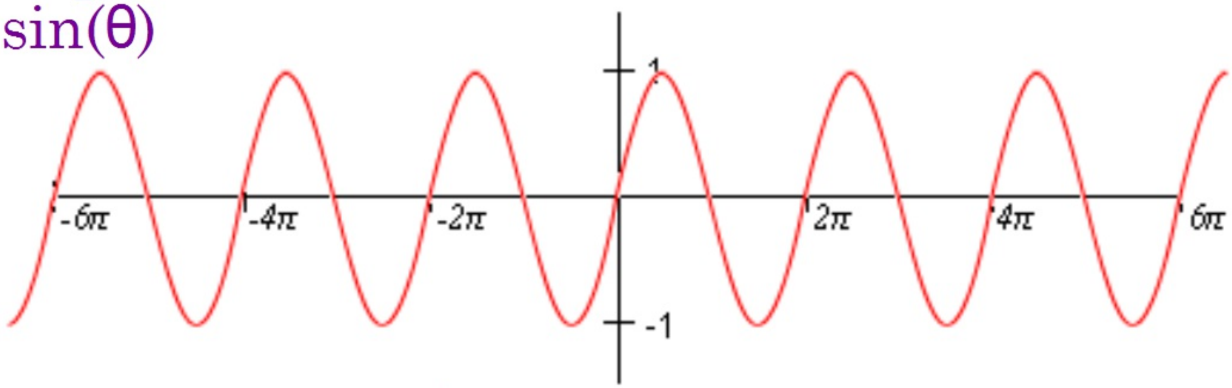
- Describe the domain and range of the functions sine and cosine.
- Understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions.
- Recognize graphically if a function is even or odd.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.4 Graphs of Sine & Cosine

12/08/14

sin(θ)



domain - all the x values that satisfy a function, all real numbers

range - all the y values that result from a function, $-1 \leq y \leq 1$

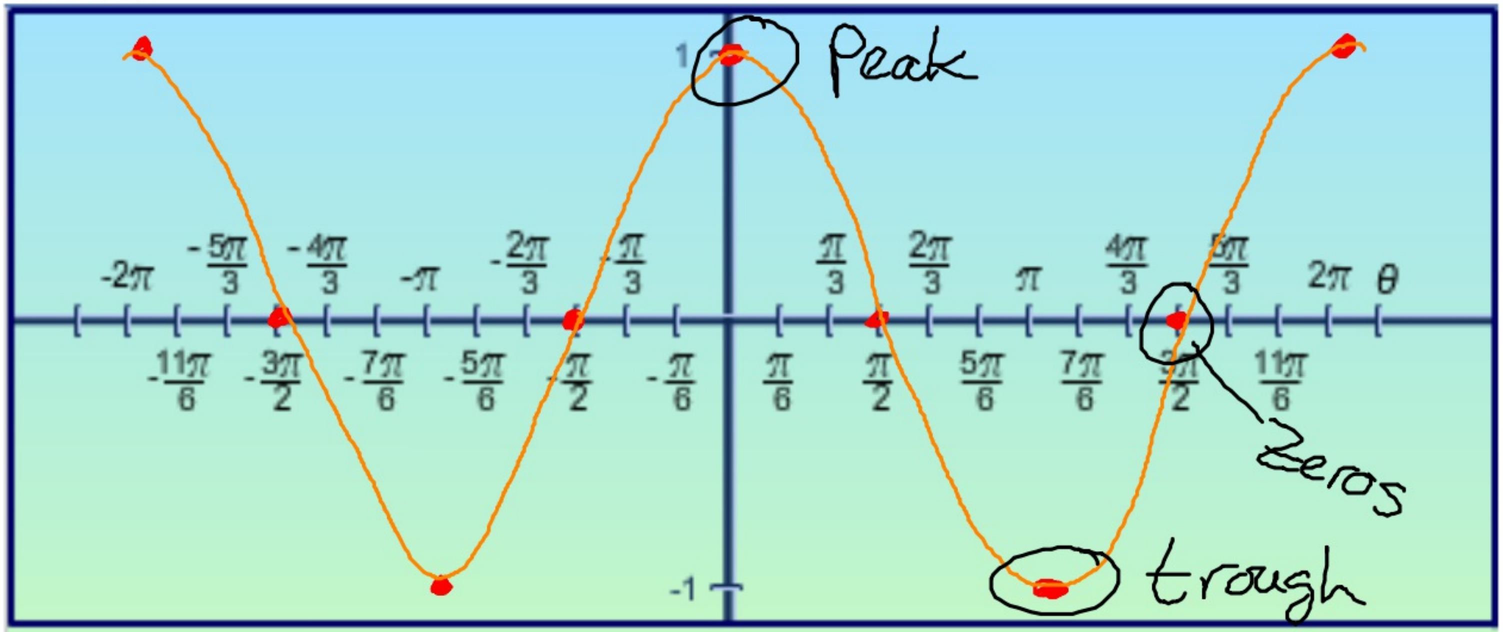
odd function -

$f(-x) = -f(x)$ odd

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/08/14

cos(θ)

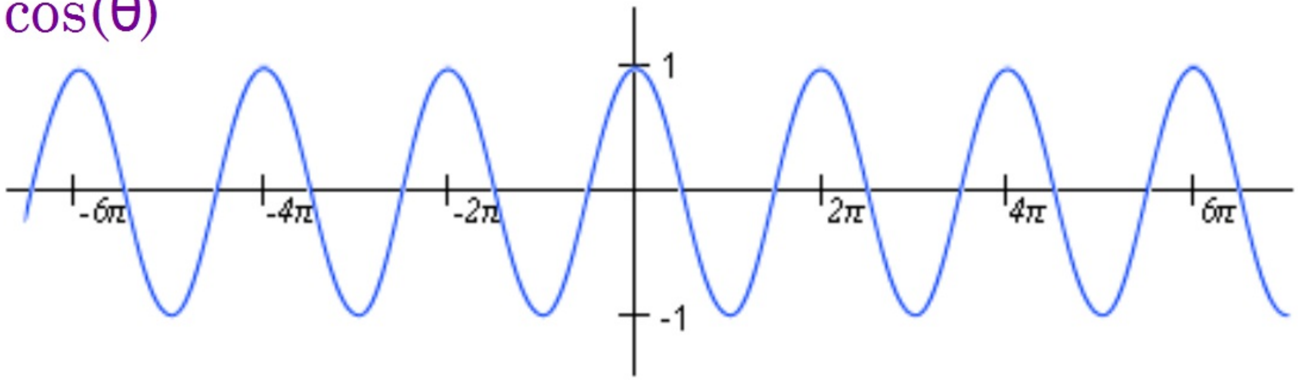


θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
cos θ	1			0			-1			0			1

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/08/14

$\cos(\theta)$



domain - all real numbers

range - $-1 \leq y \leq 1$

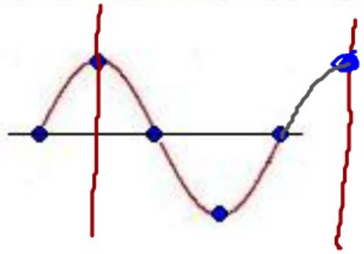
even function - Symmetrical across the y-axis

$f(-x) = f(x)$

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine

12/08/14



One period of a sinusoid with the five essential points plotted

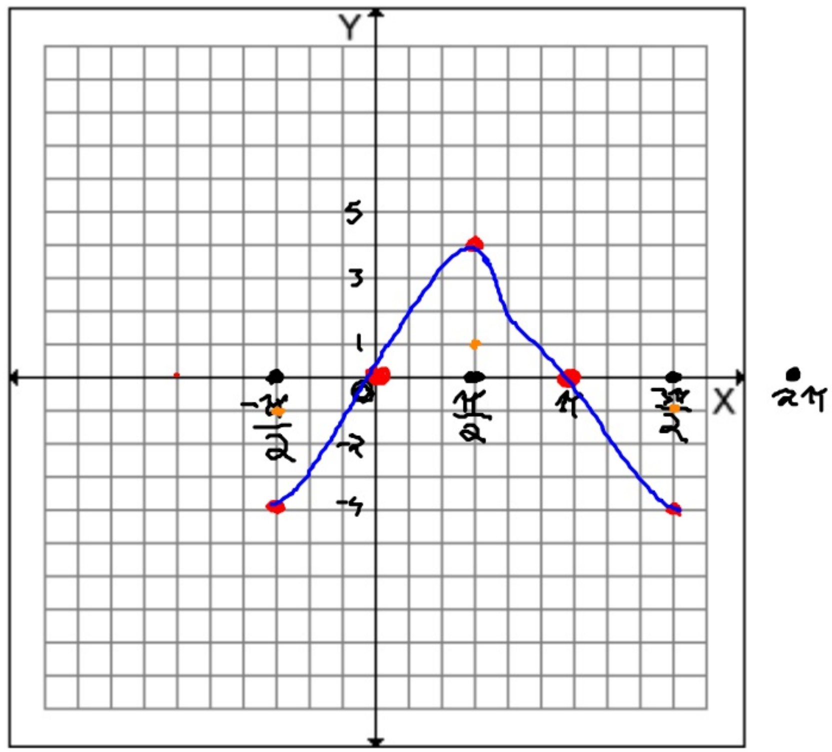
x	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π

Plot $f(x) = 4\sin(x)$

determines range

$-4 \leq y \leq 4$

period for $\sin(x)$ + $\cos(x)$ $= 2\pi$

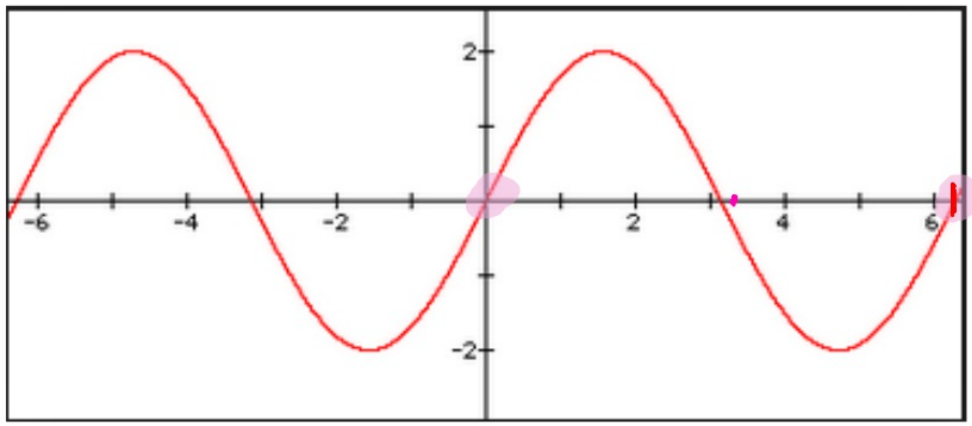


IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/08/14

Exit Ticket

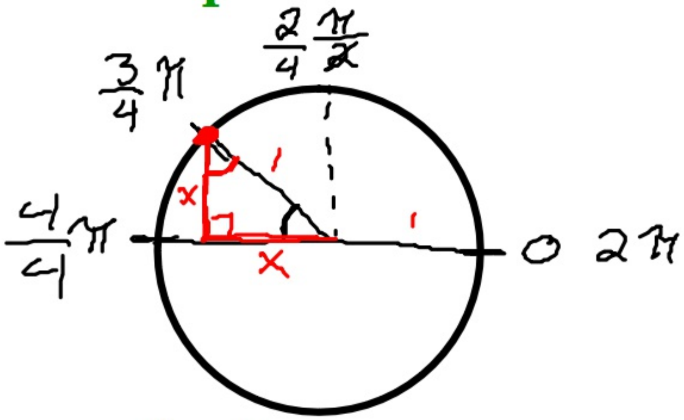
Determine the period, domain, & range of this function.



IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/09/14

What are the coordinates of the terminal point determined by $\theta = \frac{11\pi}{4}$?



$$\frac{11\pi}{4} = 2\left(\frac{3}{4}\pi\right)$$

$$x^2 + x^2 = 1^2$$

$$\frac{2x^2}{2} = \frac{1}{2}$$

$$\sqrt{x^2} = \sqrt{\frac{1}{2}}$$

$$x = \frac{1}{\sqrt{2}}$$

$$\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$$

$$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$$

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/09/14

What is the domain, range, and period of $y = \sin(x) + 1$?

$y = 1 + 1 = 2$

$y = -1 + 1 = 0$

$0 \le y \le 2$ R

all real numbers D

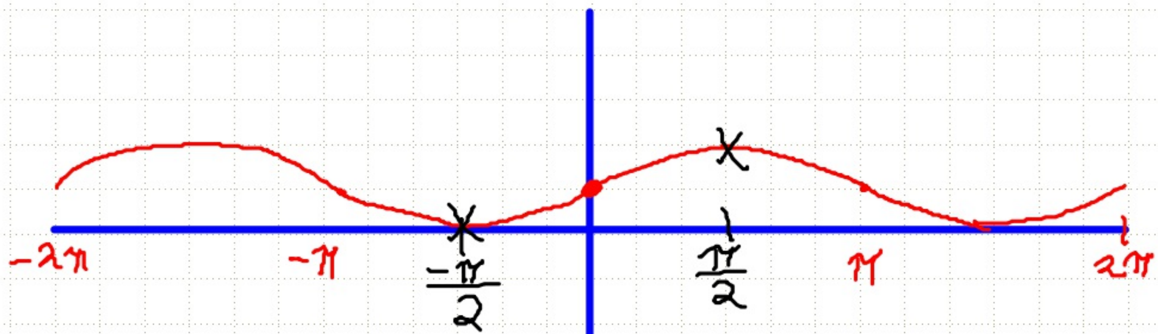
period 2π

neither even nor odd

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/09/14

Explain why $y = \sin(x) + 1$ is neither odd nor even.



$\left(-\frac{\pi}{2}, 0\right)$
$\left(\frac{\pi}{2}, 2\right)$ y's don't match, is not odd or even

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine 12/09/14

What is the domain, range, and period of $y = 2\cos(x) - 2$?

D all real numbers

R $-4 \le y \le 0$

P 2π

$\cos(x)$ $-1 \le y \le 1$

$y = 2(-1) - 2 = -4$

$y = 2(1) - 2 = 0$

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.4 Graphs of Sine & Cosine

12/09/14

$\left.\begin{array}{l}\sin(x)\\ \cos(x)\end{array}\right\}\left\{\begin{array}{l}D: \text{all real \#s}\\ R: -1 \le y \le 1\\ p: 2\pi\end{array}\right.$

Vocabulary Appendix A.2

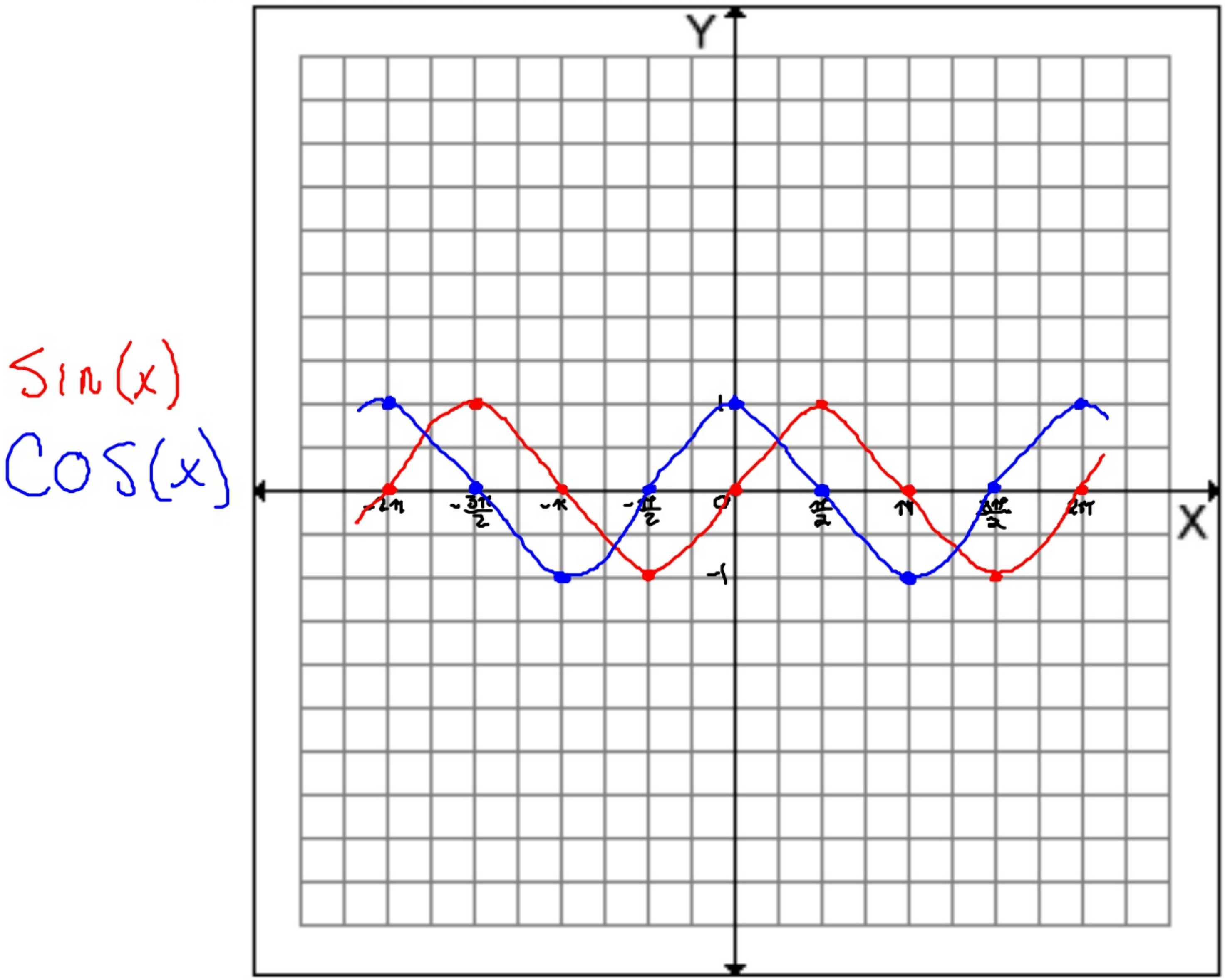
Practice 5.4.2

Apex quiz 5.4.3

IWBAT describe the domain and range of the functions sine and cosine, understand and use the periodic nature of the functions sine and cosine to sketch complete graphs of these functions, and recognize graphically if a function is even or odd.

5.5 Graphs of Other Functions 12/10/14

Sketch the graphs of the functions sine and cosine on the same set of axes.



5.5 Graphs of Other Functions 12/10/14

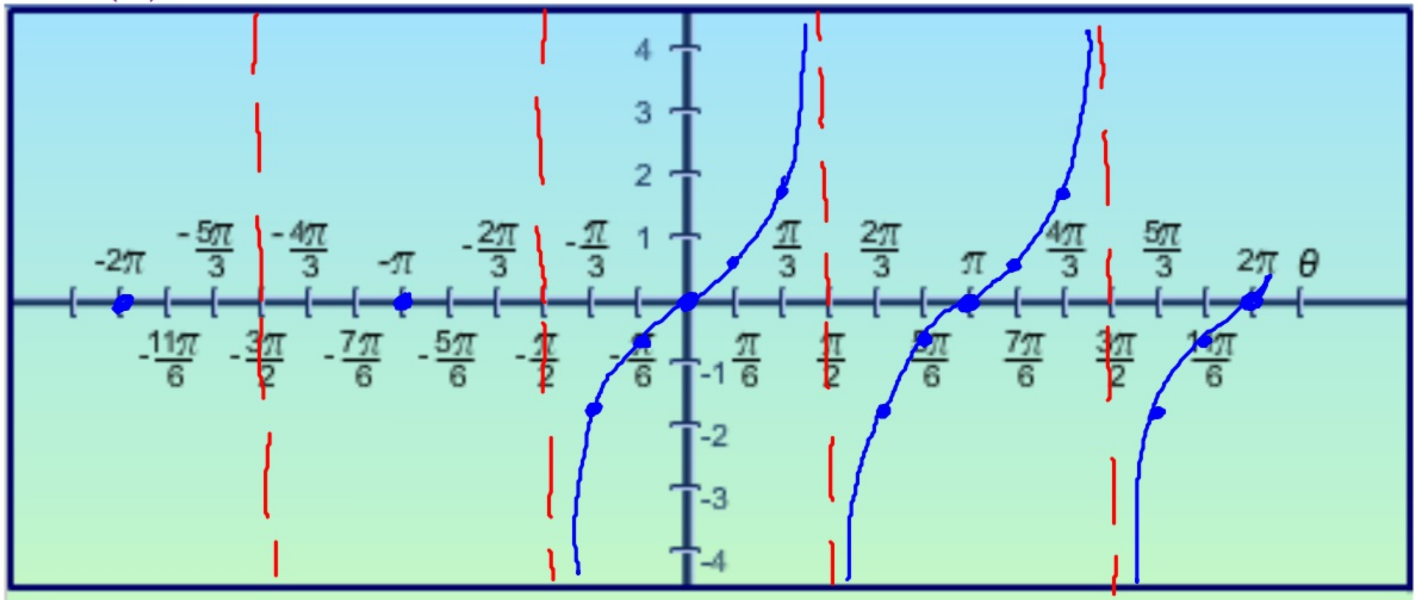
IWBAT

- Describe the domain and range of tangent, cotangent, secant, and cosecant.
- Understand the asymptotes of tangent, cotangent, secant, and cosecant.
- Identify the periods of tangent, cotangent, secant, and cosecant.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

Sketch the graphs of tangent, cotangent, secant, and cosecant.

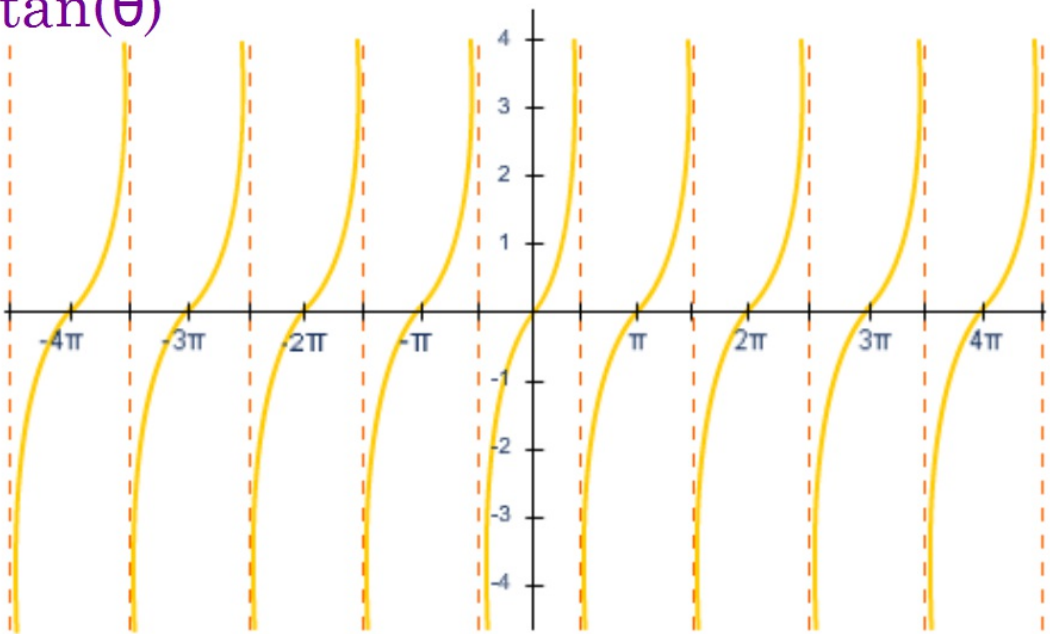
tan(θ)



θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
tan θ	0	.58	1.73	un	-1.73	-.58	0	.58	1.73	un			0

5.5 Graphs of Other Functions 12/10/14

tan(θ)



For a graphic, step-by-step process on how these graphs got their shapes, go to Apex 5.5.1 p. 9.

domain - $x \neq \frac{\pi}{2} \pm n\pi$

range - all real numbers

period - π

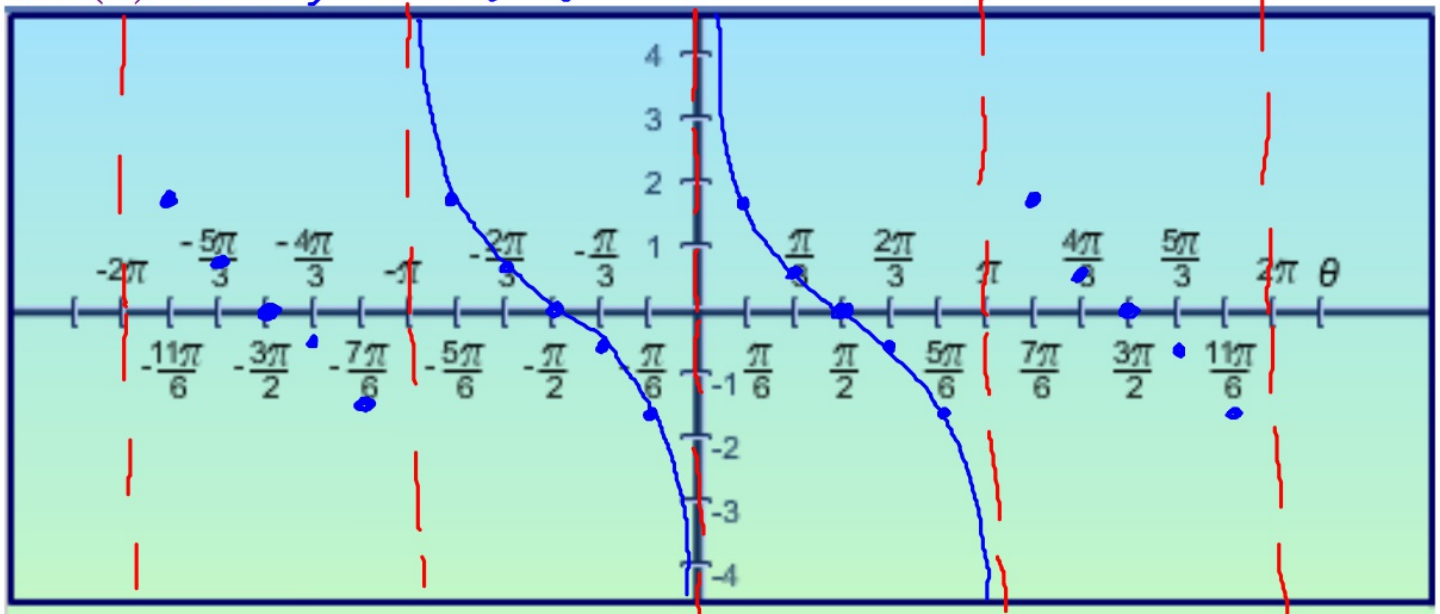
odd or even - Odd

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

5.5 Graphs of Other Functions 12/10/14

Sketch the graphs of tangent, cotangent, secant, and cosecant.

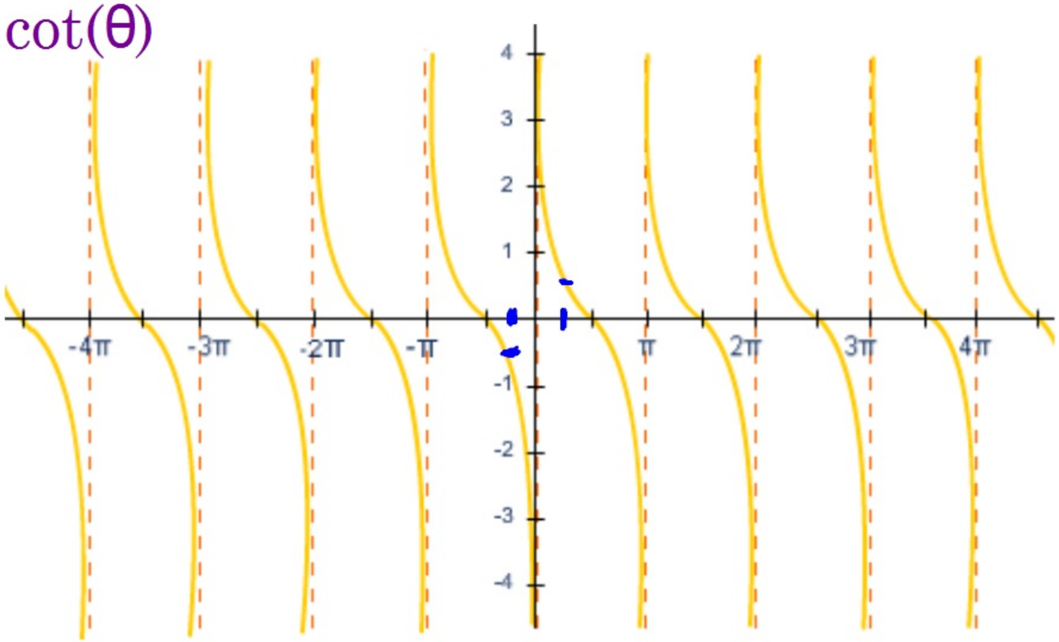
$\cot(\theta) = 1/\tan(\theta)$



θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
$\cot\theta$	undef.	1,73	.58	0	-.58	-1.73	Un	1.73					

5.5 Graphs of Other Functions 12/10/14

cot(θ)



domain - $x \neq n\pi$

range - all real numbers

period - π

odd or even -

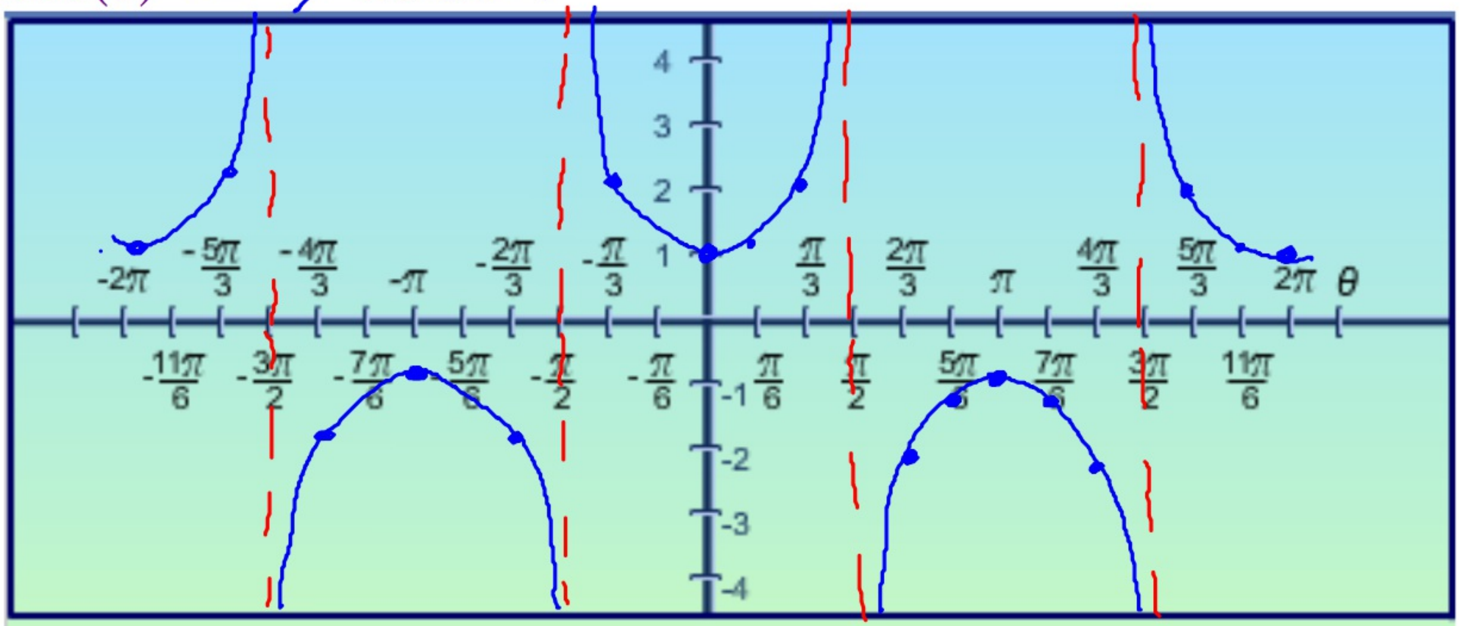
IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

5.5 Graphs of Other Functions 12/10/14

12/11/14

Sketch the graphs of tangent, cotangent, secant, and cosecant.

$\sec(\theta) = 1/\cos(\theta)$

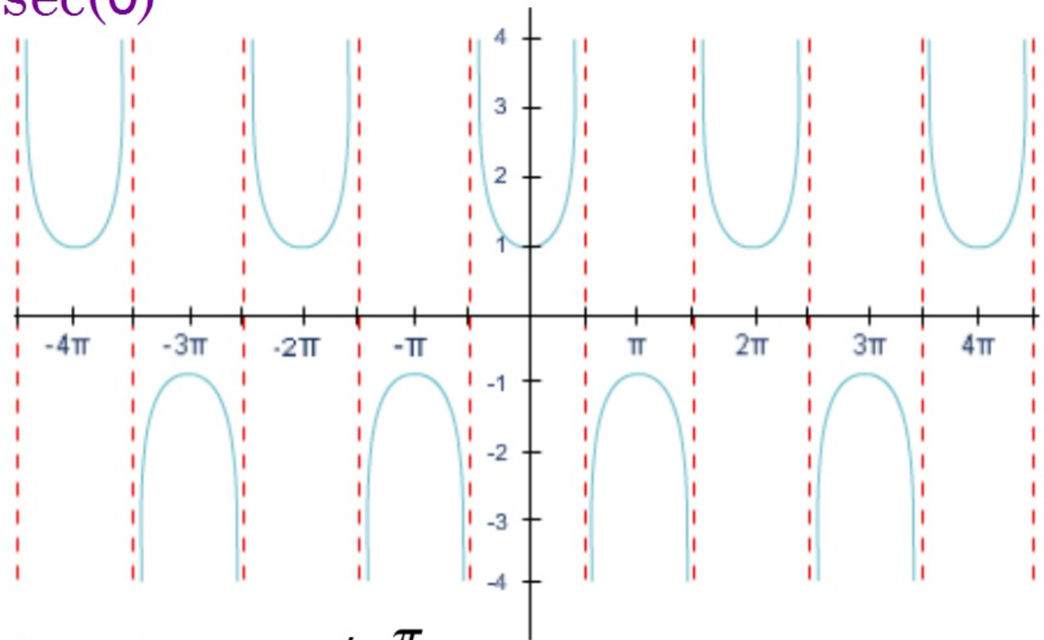


θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
$\sec\theta$	1	1.15	2	un	-2	-1.15	-1	-1.15	-2	un	2	1.15	1

5.5 Graphs of Other Functions

12/11/14

sec(θ)



domain - $x \neq \frac{\pi}{2} \pm n\pi$

range - $(-\infty, -1] \cup [1, \infty)$

period - 2π

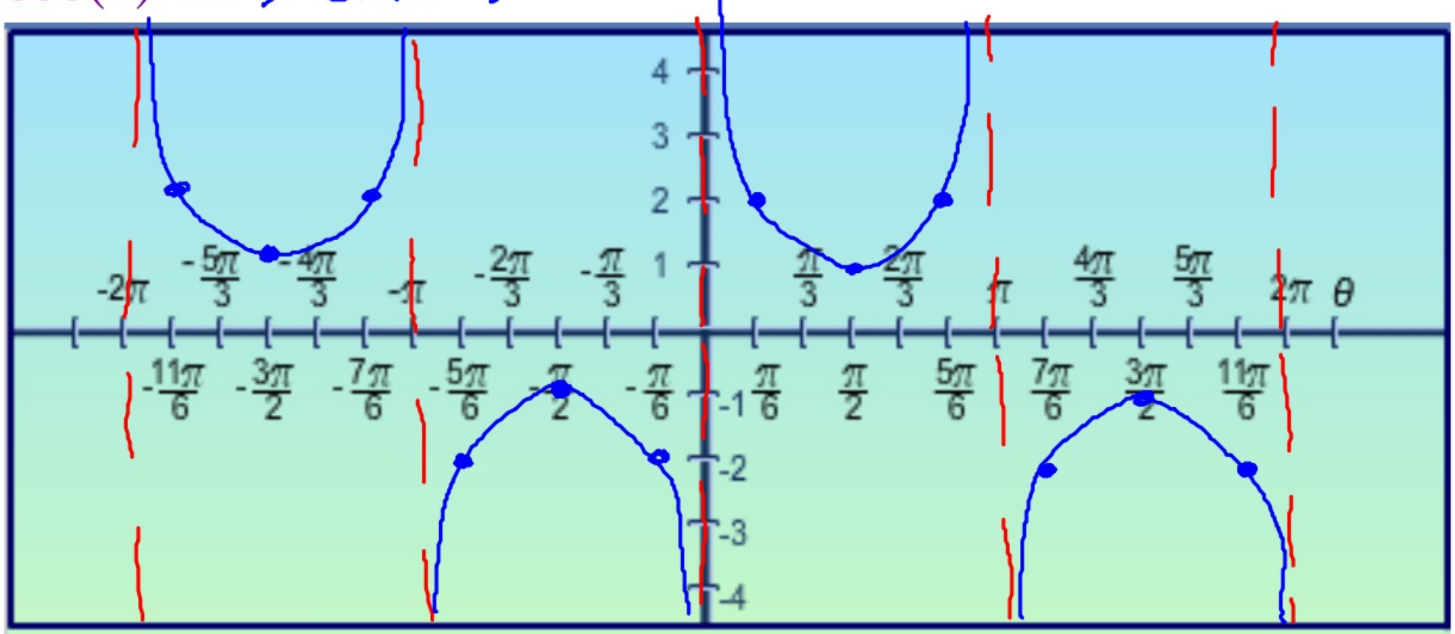
odd or even - even

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

5.5 Graphs of Other Functions 12/11/14

Sketch the graphs of tangent, cotangent, secant, and cosecant.

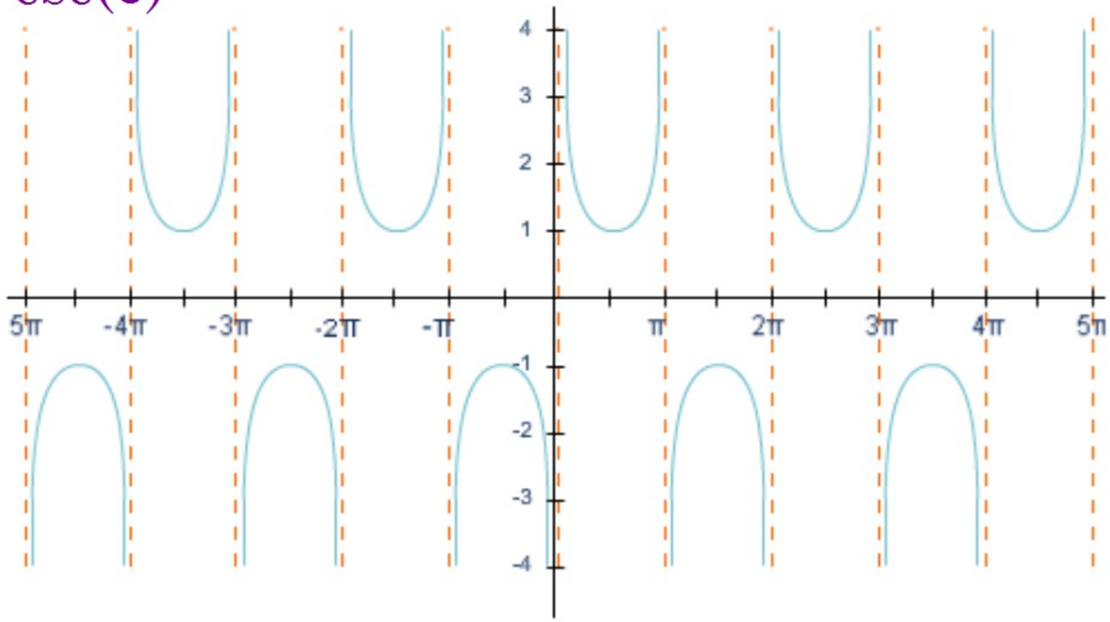
$\csc(\theta) = 1/\sin(\theta)$



θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
$\csc\theta$	undef.	2		1		2	un	-2		-1		-2	un

5.5 Graphs of Other Functions 12/11/14

csc(θ)



domain - $x \neq n\pi$

range - $(-\infty, -1] \cup [1, \infty)$

period - 2π

odd or even - odd

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

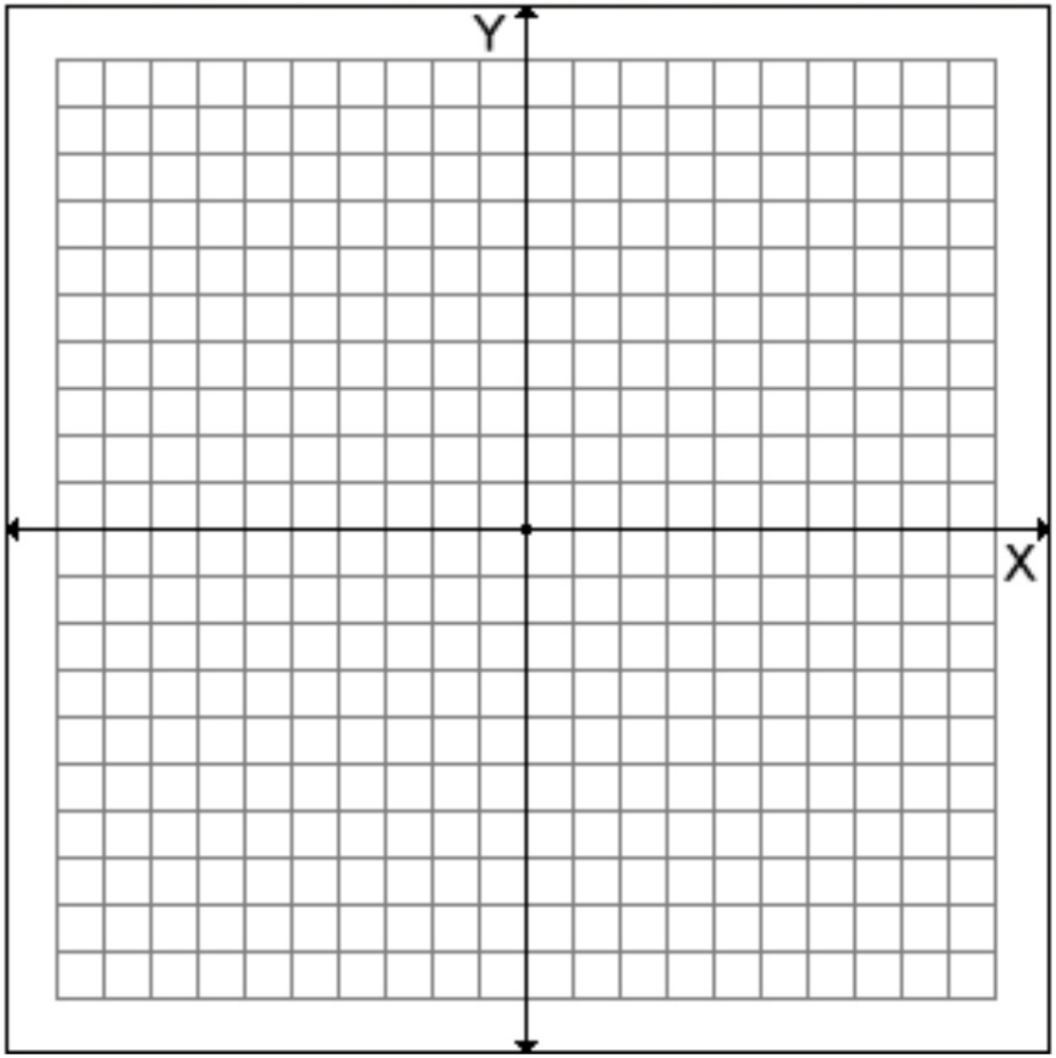
5.5 Graphs of Other Functions

12/11/14

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

Sketch the graph of tangent.

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π



D:

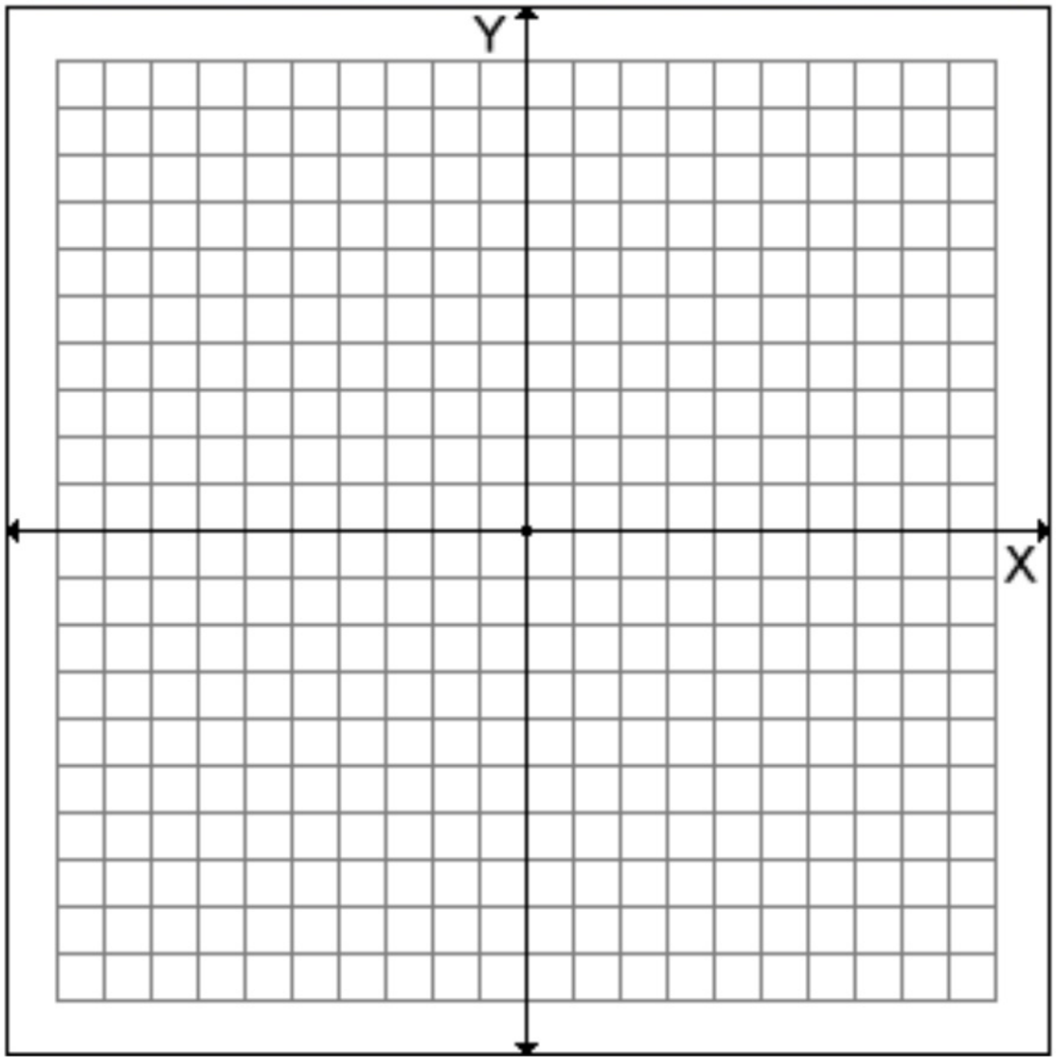
R:

P:

5.5 Graphs of Other Functions 12/11/14

Sketch the graph of cotangent.

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π



D:

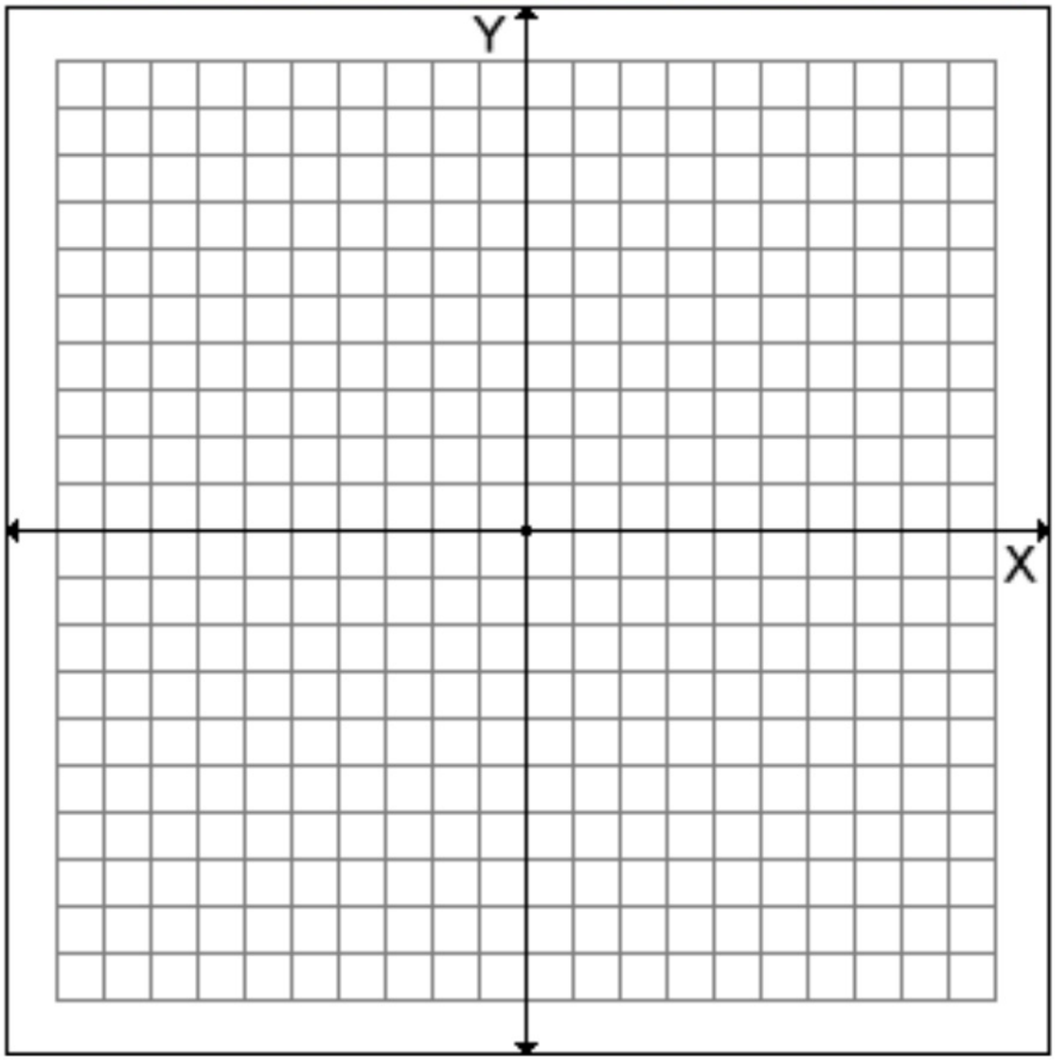
R:

P:

IWBAT describe the domain and range of tangent, cotan
cosecant; understand the asymptotes of tangent, cotang
cosecant; and identify the periods of tangent, cotangent,

Sketch the graph of secant.

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π



D:

R:

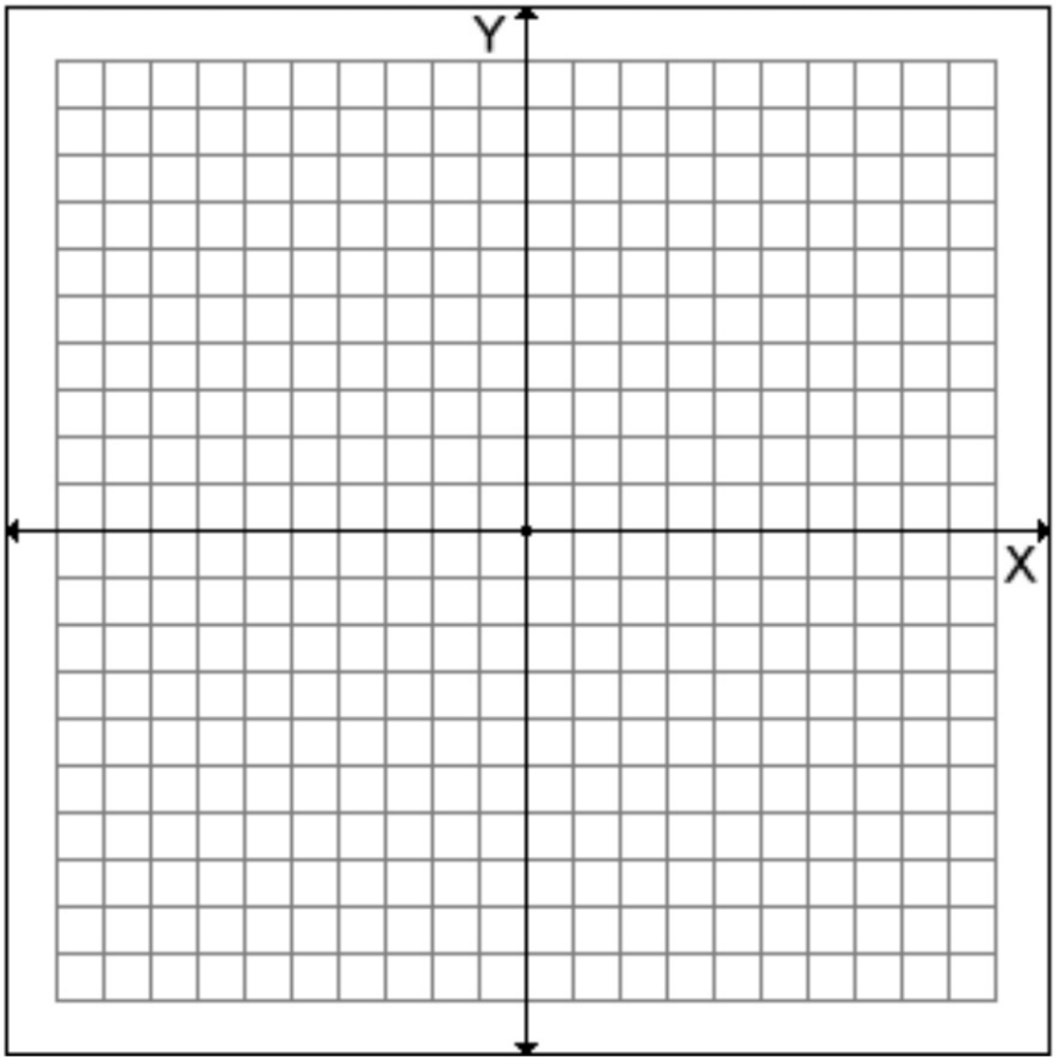
P:

IWBAT describe the domain and range of tangent, cotan
cosecant; understand the asymptotes of tangent, cotang
cosecant; and identify the periods of tangent, cotangent,

5.5 Graphs of Other Functions 12/11/14

Sketch the graph of cosecant.

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π



D:

R:

P:

IWBAT describe the domain and range of tangent, cotan
cosecant; understand the asymptotes of tangent, cotang
cosecant; and identify the periods of tangent, cotangent,

5.5 Graphs of Other Functions 12/10/14

Vocabulary for Word Wall

If you have not completed two words for the trigonometry word wall (or would like to do more words), please complete them now.
See me for available words.

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

5.5 Graphs of Other Functions 12/10/14

Exit Ticket

Name the trigonometric functions which have zeros.

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

5.5 Graphs of Other Functions 12/11/14

Vocabulary Appendix A.2

Practice 5.5.2

Apex quiz 5.5.3

IWBAT describe the domain and range of tangent, cotangent, secant, and cosecant; understand the asymptotes of tangent, cotangent, secant, and cosecant; and identify the periods of tangent, cotangent, secant, and cosecant.

Hour of Code 12/12/14

Get a computer, log in, and open the Chrome browser. You may work as pairs (2).

Proceed to one of these addresses:

Drag & Drop

- **http://hourofcode.com/code**
- **http://hourof code.com/sc**
- **http://hourofcode.com/lb**

JavaScript

- **http://hourofcode.com/kh**
- **http://hourofcode.com/cdmy**
- **http://hourofcode.com/cv**

JavaScript or Python

- **http://hourofcode.com/cc**

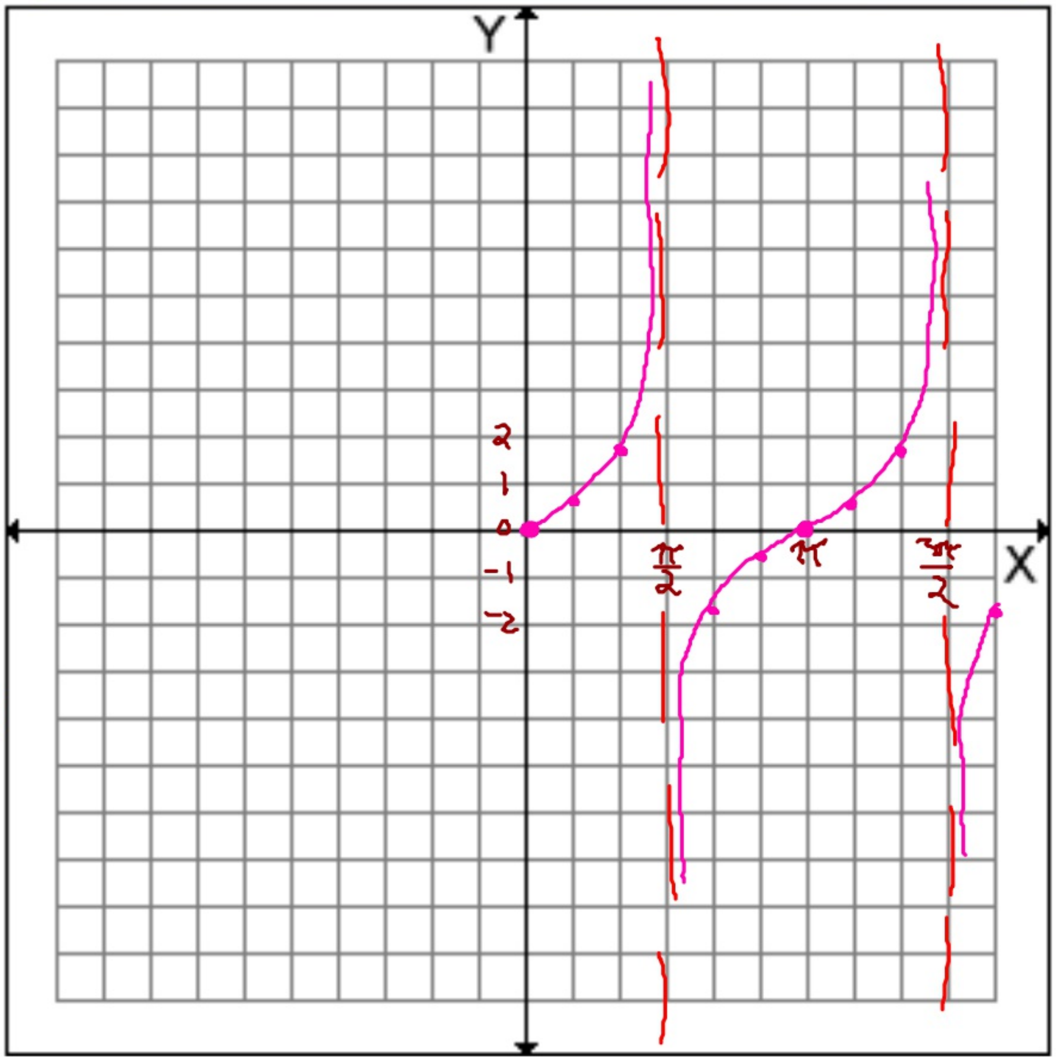
IWBAT program my own computer animation or quiz in order to understand the accessibility and utility of learning computer science.

5.6 Simple Transformations of Sinusoids 12/15/14

Sketch the graph of tangent.

$2 \cdot \frac{\pi}{2} = \pi$

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
	0	.58	1.73	un	-1.73	-.58	0	.58	1.73	un	-1.73	-.58	0



D: $x \neq \frac{\pi}{2} + n\pi$

R: all real numb.

P: π

Why study trigonometry?

Fields that use trigonometry or trigonometric functions include astronomy (especially for locating apparent positions of celestial objects, in which spherical trigonometry is essential) and hence navigation (on the oceans, in aircraft, and in space), music theory, audio synthesis, acoustics, optics, electronics, probability theory, statistics, biology, medical imaging (CAT scans and ultrasound), pharmacy, chemistry, number theory (and hence cryptology), seismology, meteorology, oceanography, many physical sciences, land surveying and geodesy, architecture, image compression, phonetics, economics, electrical engineering, mechanical engineering, civil engineering, computer graphics, cartography, crystallography and game development.

-Source (http://en.wikipedia.org/wiki/Trigonometry#Applications_of_trigonometry)

5.6 Simple Transformations of Sinusoids 12/15/14

Understand how to translate a sinusoid horizontally and vertically.

Sine + Cosine

Recall: general form of a function

$f(x) = \underbrace{a(b}_{\text{stretch}}(x \pm \underbrace{h}_{\leftrightarrow \text{ move}}) \pm \underbrace{k}_{\updownarrow \text{ move}}$

General equation of a sinusoid:

$Af(B(x \pm C)) \pm D$

5.6 Simple Transformations of Sinusoids 12/15/14

IWBAT

- Understand how to vary the amplitude and period of a sinusoid.
- Determine the amplitude and period of a general sinusoid.
- Know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.6 Simple Transformations of Sinusoids 12/15/14

General equation of a sinusoid:

$Af(B(x \pm C)) \pm D$

The effect of D

$\sin(x) + 2$ shifted up 2

$\sin(x) - 5$ shifted down 5

$+D$ shift up

$-D$ shift down

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/15/14

General equation of a sinusoid:

$Af\,(B\,(x \pm C)) \pm D$

The effect of C

$\sin(x + 6)$ Same graph

$\sin(x + 5)$ shift left 5

$\sin(x - 7)$ shift right 7

$\sin(x - 3)$ shift right 3

same graph as left 3

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/15/14

General equation of a sinusoid:

$Af\,(B\,(x \pm C)) \pm D$

The effect of A

$\underline{3}\sin(x)$ Vertical stretch

$\underline{0.2}\sin(x)$ Vertical compression

$A > 1$ Vertical stretch

$0 < A < 1$ Vertical compression

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/15/14

General equation of a sinusoid:

$Af\,(B\,(x \pm C))\pm D$

The effect of B

$\sin(11x)$ horizontal compression

$\sin(0.5x)$ horizontal stretch

$B > 1$

$0 < B < 1$

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/15/14

Exit ticket:

How do you modify the shape of a sinusoid?

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/16/14

Describe how to vary the amplitude and period of a sinusoid.

$$y = Af(B(x \pm C)) \pm D$$

A $\quad y = 3\sin(x)$  change in amplitude

B $\quad y = \sin(3x)$  change in the period

5.6 Simple Transformations of Sinusoids 12/16/14

General equation of a sinusoid:

$Af\,(B\,(x \pm C)) \pm D$

The effect of B

$\frac{1}{11} \cdot 2\pi$ $\sin(11x)$ $\frac{2\pi}{11}$ horizontal compression

$\frac{1}{1/2} \cdot 2\pi$ $\sin(0.5x)$ 4π horizontal stretch

$B > 1$ horizontal compression

$0 < B < 1$ horizontal stretch

Period: $\frac{1}{B} \cdot p$

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/16/14

Reflecting across the x-axis

$\sin(x)$

period: 2π

odd

D: all real #s

R: $-1 \le y \le 1$

$\sin(-x)$ ✓ $-B$

$-\sin(x)$ ✓ $-A$

$-.5\sin(x)$ $\sin(-.5x)$

$.5\sin(x)$ $\sin(.5x)$

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/16/14

Reflecting across the x-axis

$\cos(x)$

period: 2π D: all real #s

even R: $-1 \le y \le 1$

$\cos(-x)$ same graph $-B$

$-\cos(x)$ ✓ $-A$

flip odd $-A$ or $-B$

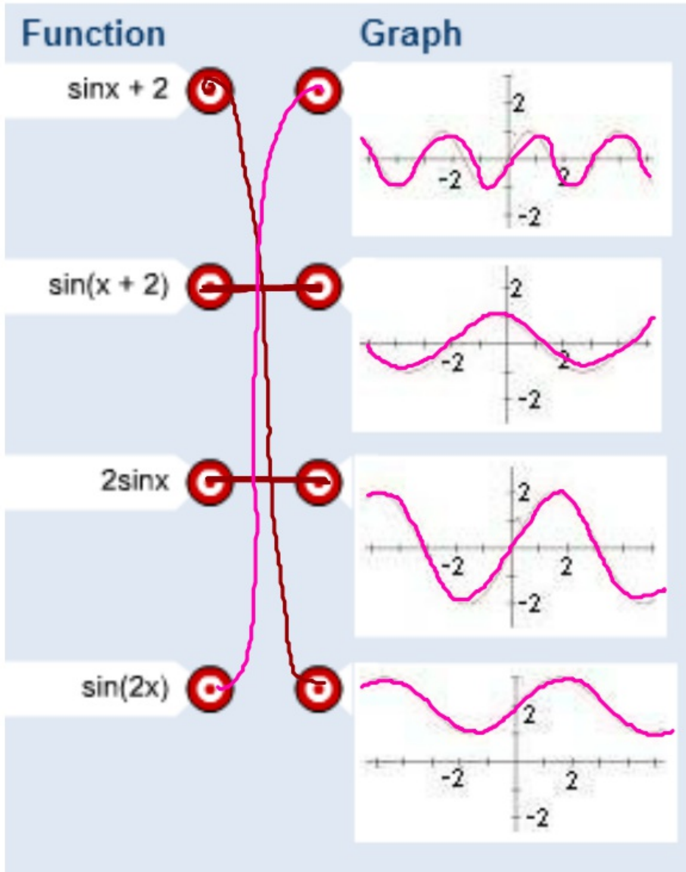
flip even $-A$

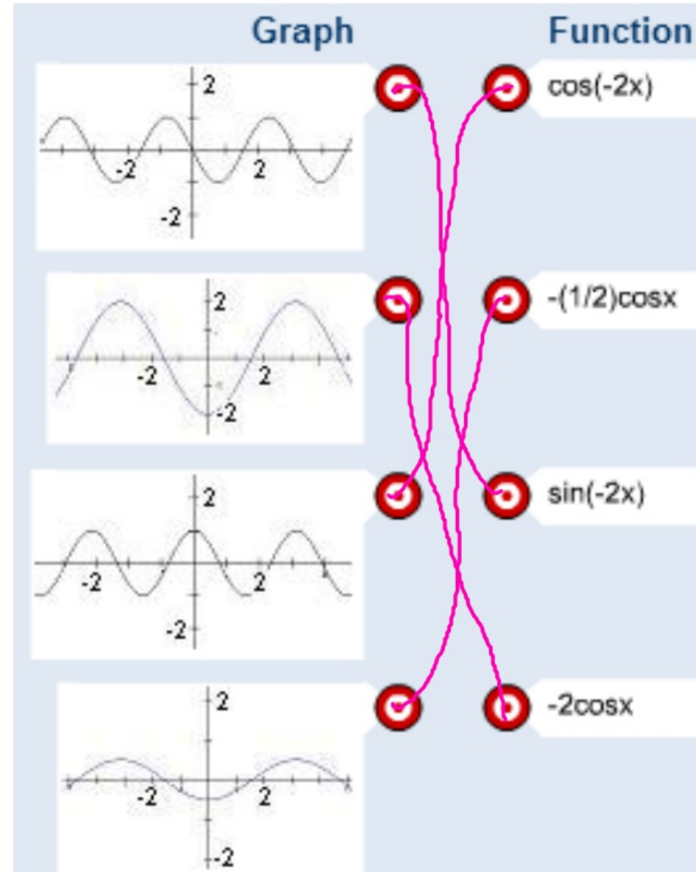
$-11\cos(x)$ $.5\cos(x)$

$11\cos(x)$ $-.5\cos(x)$

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/16/14





IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.6 Simple Transformations of Sinusoids 12/16/14

Vocabulary Appendix A.2
Practice 5.6.2
Apex quiz 5.6.3

IWBAT understand how to vary the amplitude and period of a sinusoid, determine the amplitude and period of a general sinusoid, and know how to flip sinusoids and how such flips relate to the even and odd properties of sine and cosine.

5.7 General Transformations of Periodic Graphs 12/17/14

How does one translate a sinusoid horizontally and vertically?

$$y = A\sin(B(x \pm C)) \pm D$$

$V\uparrow \quad +D \qquad\qquad h\rightarrow \quad -C$

$V\downarrow \quad -D \qquad\qquad h\leftarrow \quad +C$

$$y = a\,f(b(x-h)) + k$$

5.7 General Transformations of Periodic Graphs 12/17/14

Identify the simple transformations that make up a general transformation.

$$y = A \sin(B (x \pm C)) \pm D$$

B Change the period (frequency)

C horizontal translation

D vertical translation

A Change the amplitude (height)

-A flips upside down

5.7 General Transformations of Periodic Graphs 12/17/14

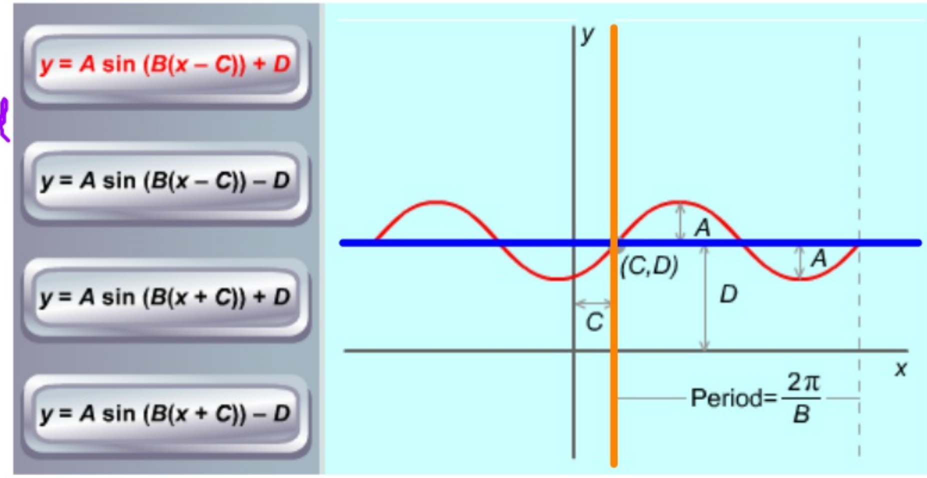
IWBAT

- Sketch the graph of a general trigonometric function.
- Determine the closed-form expression from the graph of a transformed trigonometric function.

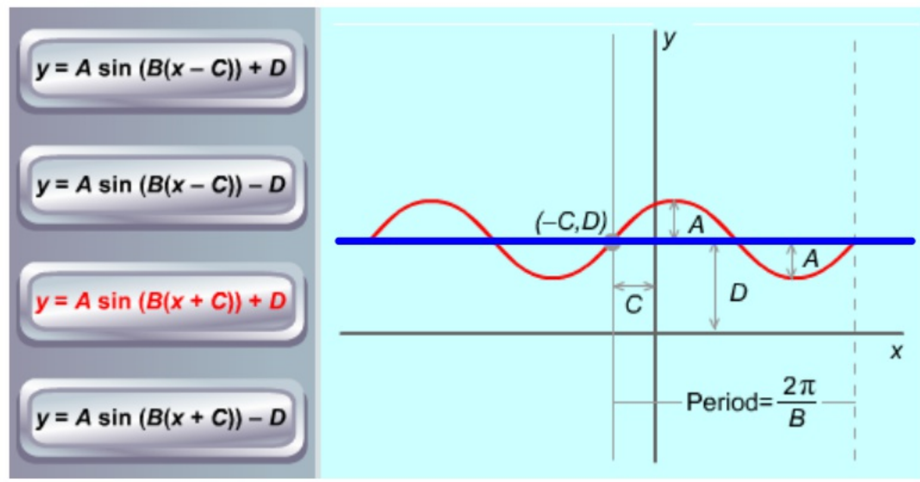
I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.7 General Transformations of Periodic Graphs 12/17/14

sinusoidal axis - the point determined by (C, D)

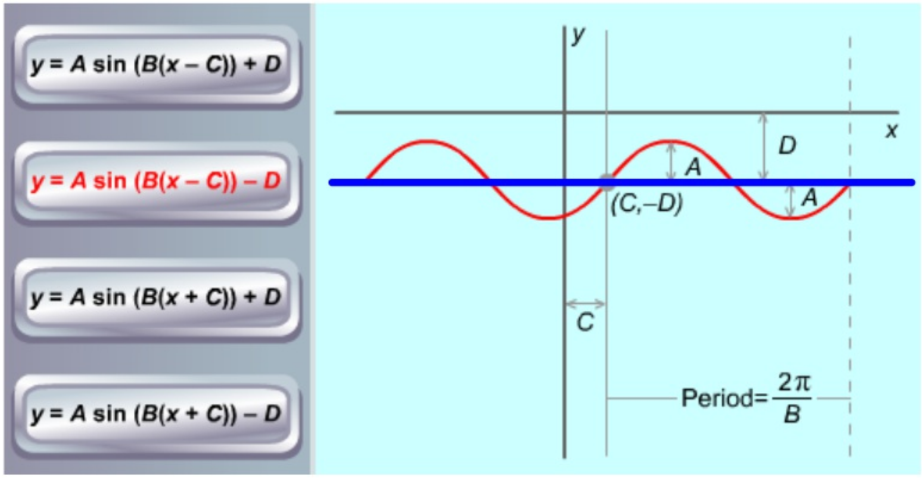


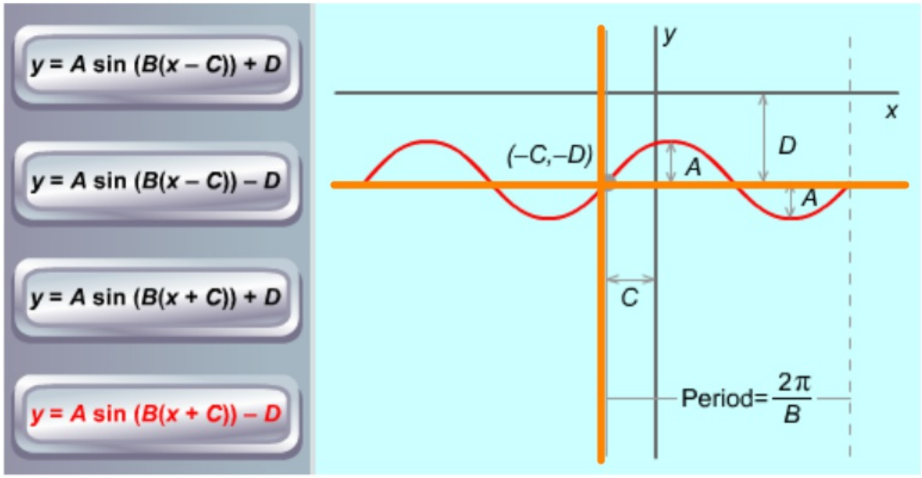
midline - the line about which the function oscillates



IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/17/14

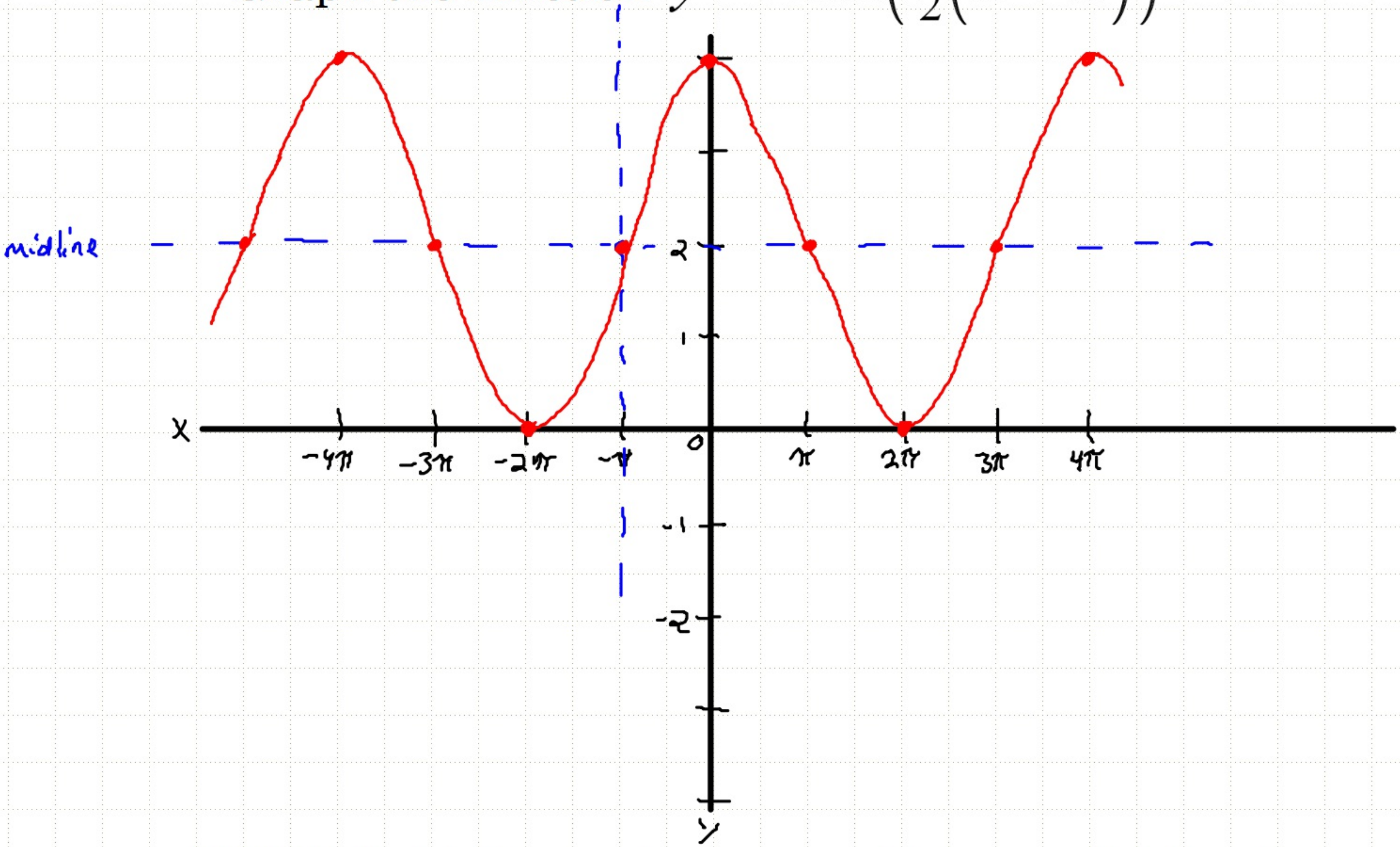




IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/17/14

Graph the function $y = 2\sin\left(\frac{1}{2}(x+\pi)\right) + 2$



IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/17/14

Name the function for this graph.

cos

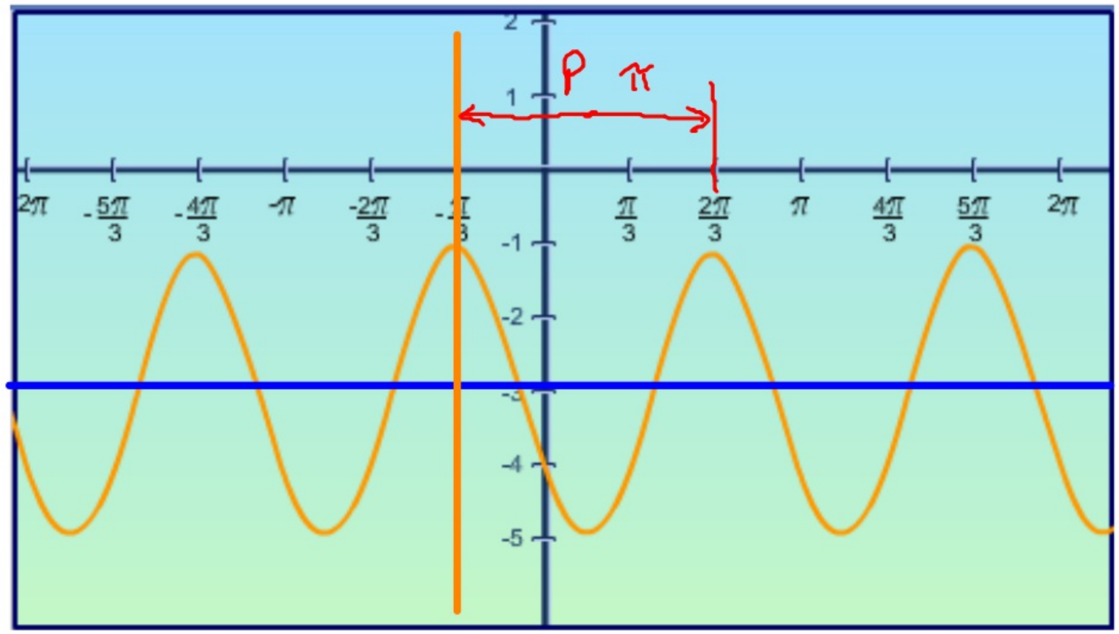
$A = 2$

$C = +\frac{\pi}{3}$

$D = -3$

$B = 2$

$P = \frac{2\pi}{B}$



$y = 2\cos\left(2\left(x + \frac{\pi}{3}\right)\right) - 3$

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/17/14

Name another function for this graph.

sin

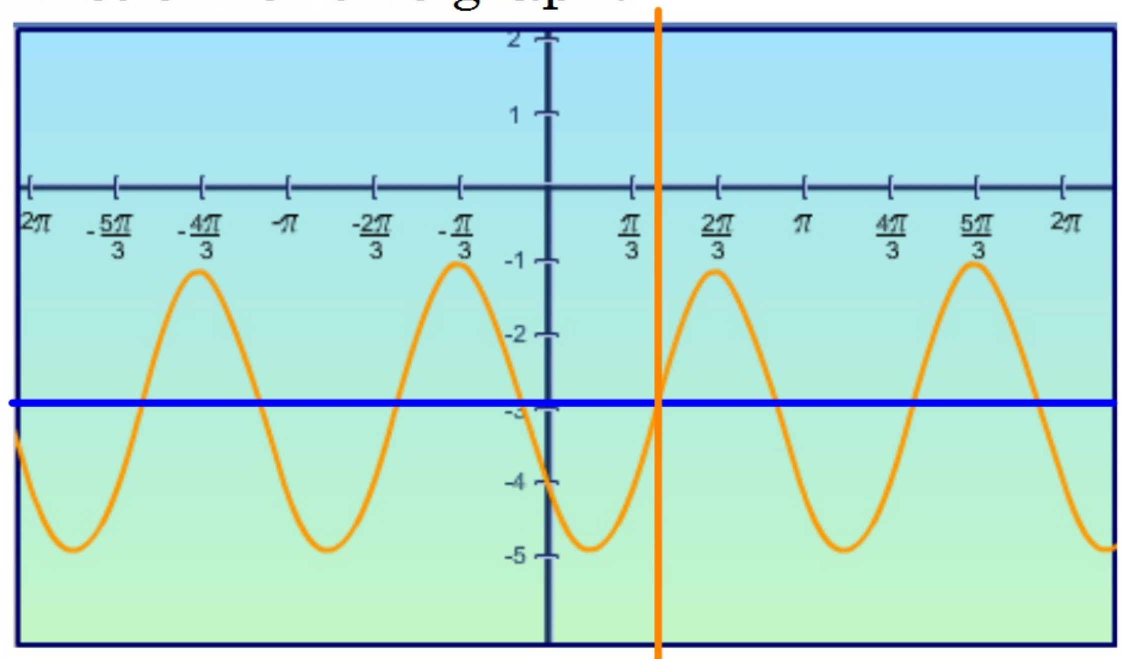
$A = 2$

$B = 2$

$C = -\frac{4\pi}{9}$ ←

$D = -3$

$\frac{3\pi}{3} \cdot \frac{3}{3} + \frac{\pi}{9} = \frac{4\pi}{9}$



$y = 2\sin\left(2\left(x - \frac{4\pi}{9}\right)\right) - 3$

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/17/14

All sinusoids can be written using only sine or cosine.

$$\sin(x + \tfrac{\pi}{2}) = \cos(x)$$

&

$$\cos(x - \tfrac{\pi}{2}) = \sin(x)$$

Transform this sinusoid into the other sinusoid which gives the same graph.

$\frac{3}{4}\pi - \frac{1}{2}\pi = \frac{1}{4}\pi$

$$y = 5\cos\left(\tfrac{1}{3}\left(x + \tfrac{3\pi}{4}\right)\right) - 6$$

$$y = 5\sin\left(\tfrac{1}{3}\left(x + \tfrac{\pi}{4}\right)\right) - 6$$

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/17/14

Exit Ticket

Transform this sinusoid into the other sinusoid which gives the same graph.

$$y = \frac{1}{2}\sin\left(2\left(x + \frac{\pi}{2}\right)\right) - 1$$

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/18/14

How does one transform a sine function into a cosine function?

$$\sin\left(x+\frac{\pi}{2}\right) = \cos(x)$$

$$\cos\left(x-\frac{\pi}{2}\right) = \sin(x)$$

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/18/14

Given the following function, name the location of the sinusoidal axis, the vertical shift, the horizontal shift, the amplitude (when appropriate), whether it has been reflected across the x-axis, and the period.

$$y = -2\cos\left(\frac{2}{5}\left(x+2\right)\right)-9$$

(C, D) Sinusoidal axis location: $(-2, -8)$

C horizontal shift: 2 left

D Vertical shift: 9 down

A Amplitude: 2

$-A$ Reflected: yes

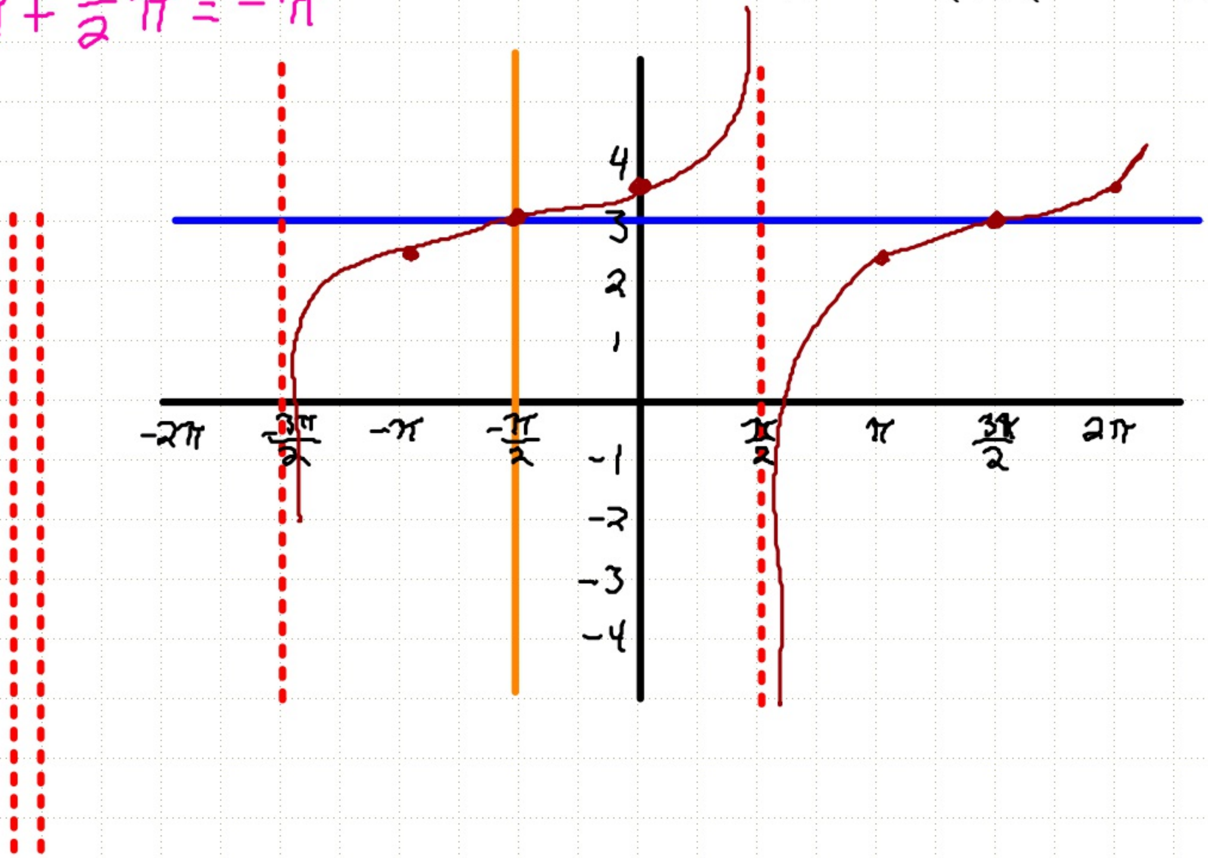
B period: $\dfrac{2\pi}{\frac{2}{5}} = \cancel{2}\pi \cdot \dfrac{5}{\cancel{2}} = 5\pi$

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/18/14

Transform tan(θ) $y = \frac{1}{2}\tan\left(\frac{1}{2}\left(x + \frac{\pi}{2}\right)\right) + 3$

$-\frac{3}{2}\pi + \frac{1}{2}\pi = -\pi$

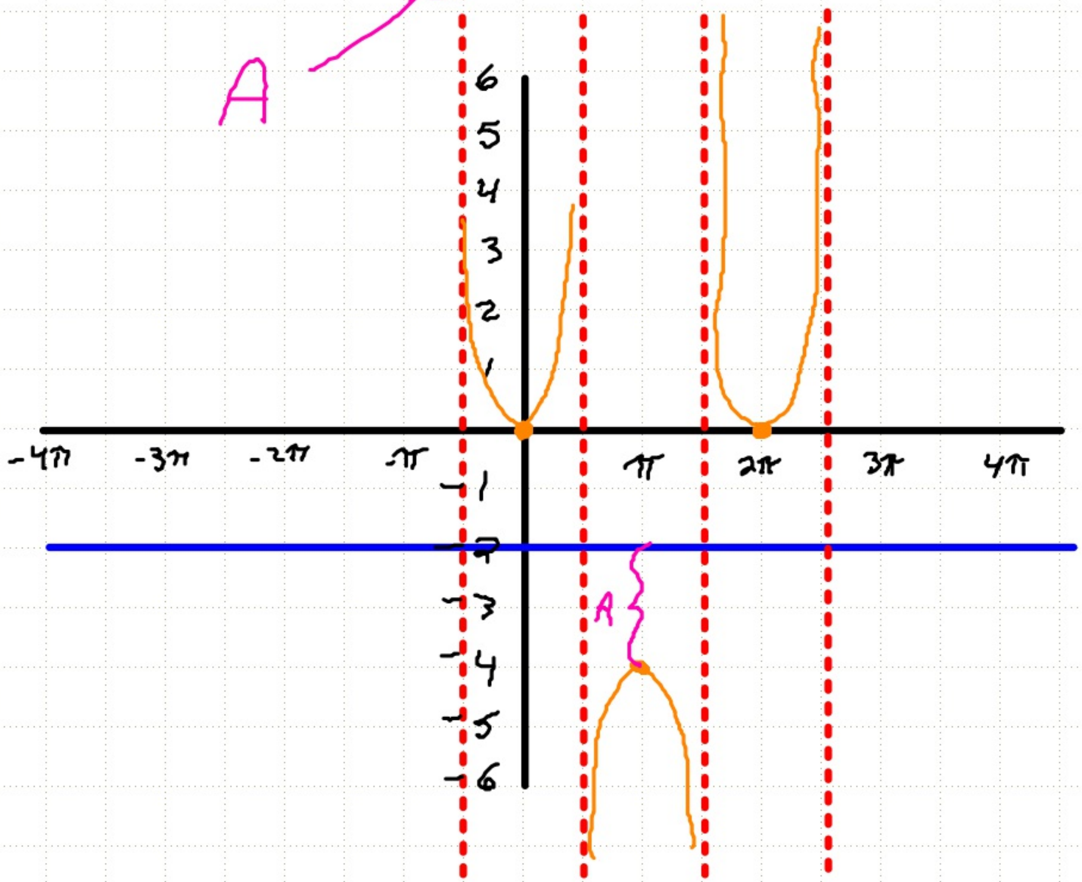


IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/19/14

Transform sec(θ) $y = 2\sec(2(x-\pi)) - 2$

A



IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs 12/19/14

Given the following function, name the location of the sinusoidal axis, the vertical shift, the horizontal shift, the amplitude (when appropriate), whether it has been reflected across the x-axis, and the period.

$$y = \frac{3}{2}\tan\left(-4\left(x-\pi\right)\right)+1$$

period $(B=4)$ $\frac{\pi}{4}$

HT π right

VT 1 up

amplitude stretched

-4 flips across midline

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.7 General Transformations of Periodic Graphs   12/19/14

Vocabulary Appendix A.2
Practice 5.7.2
Apex quiz 5.7.3

IWBAT sketch the graph of a general trigonometric function, and determine the closed-form expression from the graph of a transformed trigonometric function.

5.8 Identities and Proof 12/19/14

Distinguish between a trigonometric identity and a trigonometric equation.

A trigonometric identity is a statement (written as an equation) that says one trigonometric expression means exactly the same thing as another trigonometric expression.

$$\sin(x + \tfrac{\pi}{2}) = \cos(x)$$

identity

True for every x.

$$1.73 = \sin(x)$$

equation

True only for certain values of x.

5.8 Identities and Proof 12/19/14

IWBAT

- Understand the general technique for proving identities.
- Review the Pythagorean identities.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.8 Identities and Proof 12/19/14

Identities which we have already seen

$$\csc(\theta) = \frac{1}{\sin(\theta)} \qquad \sec(\theta) = \frac{1}{\cos(\theta)}$$

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$$

$$\cot(\theta) = \frac{1}{\tan(\theta)} \qquad \cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

$$\cos^2(\theta) + \sin^2(\theta) = 1$$

If

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$$

then

$$\tan^2(\theta) = \frac{\sin^2(\theta)}{\cos^2(\theta)}$$

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 12/19/14

$$\frac{\cos^2(\theta)}{\sin^2\theta} + \frac{\cancel{\sin^2}(\theta)}{\cancel{\sin^2}\theta} = \frac{1}{\sin^2\theta}$$

Divide by $\sin^2(\theta)$.

$$\frac{\cos^2\theta}{\sin^2\theta} + 1 = \frac{1}{\sin^2\theta}$$

$$\cot^2\theta + 1 = \csc^2\theta$$

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

$$\frac{\cancel{\cos^2(\theta)}}{\cancel{\cos^2\theta}} + \frac{\sin^2(\theta)}{\cos^2\theta} = \frac{1}{\cos^2\theta}$$

Divide by $\cos^2(\theta)$.

$$1 + \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$$

$$1 + \tan^2\theta = \sec^2\theta$$

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 12/19/14

Exit Ticket

What is a Pythagorean identity?

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 1/06/15

What is a trigonometric identity?

A trig. identity is an equation which sets two trig. expressions equal to each other.

e.g. $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

5.8 Identities and Proof

1/06/15

IWBAT

- Understand the general technique for proving identities.
- Review the Pythagorean identities.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.8 Identities and Proof 1/06/15

To solve an identity, you need to prove one side of an equality is equal to the other. As a general rule, it is a good idea to start with the side that looks most complicated.

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\csc\theta = \frac{1}{\sin\theta}$

Other things that might help you in proving an identity.

- Sometimes, it helps to write everything in terms of the functions sine and cosine.
- Remember to use your algebra skills, such as factoring or simplifying fractions by getting a common denominator. Oftentimes, you will be able to simplify a given identity before trying to prove it.
- Use the identities you already know to help you.

You must always justify your actions in a proof.

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof

1/06/15

Prove $(\sin(x) + \cos(x))^2 = 1 + 2\sin(x)\cos(x)$

$(\sin x + \cos x)^2$

$(\sin x + \cos x)(\sin x + \cos x)$ expand the square

$\sin^2 x + \sin x \cos x + \cos x \sin x + \cos^2 x$

$\sin^2 x + \cos^2 x + \sin x \cos x + \sin x \cos x$ group like terms

$\sin^2 x + \cos^2 x + 2 \sin x \cos x$ combine like terms

$\sin^2 x + \cos^2 x = 1$ def. of unit circle

$1 + 2 \sin x \cos x$ substitution

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof

1/06/15

Prove $\tan^2(\theta) + 1 = \sec^2(\theta)$

$$\frac{\sin^2\theta}{\cos^2\theta} + 1 = \frac{1}{\cos^2\theta}$$

$$\frac{\sin^2\theta}{\cos^2\theta} + \frac{\cos^2\theta}{\cos^2\theta}$$ find common denominator

$$\frac{1}{\cos^2\theta}\left(\sin^2\theta + \cos^2\theta\right)$$ factor

$$\sin^2\theta + \cos^2\theta = 1$$ def. of unit circle

$$\frac{1}{\cos^2\theta}(1)$$ substitution

$$\frac{1}{\cos^2\theta}$$ simplify

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 1/06/15

Prove $\sin^2(\theta)\csc^2(\theta) = \sin^2(\theta) + \cos^2(\theta)$

$\sin^2\theta + \cos^2\theta = 1$ def. of unit circle

$\sin^2\theta \csc^2\theta = 1$ Substitute

$\sin^2\theta \frac{1}{\sin^2\theta} = 1$

$\frac{\sin^2\theta}{\sin^2\theta} = 1$ multiply

$1 = 1$ Simplify

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof

1/06/15

Prove $$\frac{\cot(x)}{\csc(x)-\sin(x)} = \sec(x)$$

$$\frac{\sin x}{\frac{1}{\sin x}}$$

Calculation	Reason
$\frac{\cos x/\sin x}{\frac{1}{\sin x} - \sin x}$	This follows by the definition of $\cot x = \frac{\cos x}{\sin x}$ and $\csc x = \frac{1}{\sin x}$.
$\frac{\cos x}{1-\sin^2 x}$	This follows from factoring out $\frac{1}{\sin x}$ from the numerator and denominator and then canceling.
$\frac{\cos x}{\cos^2 x} = \frac{1}{\cos x}$	This follows from the Pythagorean identity $\cos^2 x = 1 - \sin^2 x$.
$\sec x$	This follows by the definition of $\sec x = \frac{1}{\cos x}$.

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 1/06/15

Prove $(\sec(x) + \sin(x))\cot(x) = \csc(x) + \cos(x)$

Calculation	Reason
$(\sec x + \sin x)\cot x = \left(\frac{1}{\cos x} + \sin x\right)\frac{\cos x}{\sin x}$	$\sec x = \frac{1}{\cos x}$ and $\cot x = \frac{\cos x}{\sin x}$
$= \frac{1}{\sin x} + \cos x$	distribute and simplify
$= \csc x + \cos x$	$\csc x = \frac{1}{\sin x}$

RHS

$$\frac{1}{\sin x} + \cos x$$

$$\frac{1}{\sin x} + \frac{\cos x \sin x}{\sin x}$$

$$\frac{\cos x}{\cos x \sin x} + \frac{\cos x \sin x}{\sin x} = \frac{\cos x}{\sin x}\left(\frac{1}{\cos x} + \sin x\right)$$

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 1/07/15

What is a trigonometric identity?

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof 1/07/15

Prove $(\csc x + \cot x)(\csc x - \cot x) = 1$

Calculation **Reason**

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof

1/07/15

Prove $\cot^2 x = \dfrac{\cos x}{\sin x * \tan x}$

Calculation **Reason**

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.8 Identities and Proof

1/07/15

Vocabulary Appendix A.2
Practice 5.8.2

IWBAT understand the general technique for proving identities, and review the Pythagorean identities.

5.9 Trigonometric Identities 1/08/15

Express in terms of sine and cosine

1. sec x $\frac{1}{\cos\theta}$

2. csc x $\frac{1}{\sin\theta}$

3. tan x $\frac{\sin(\theta)}{\cos(\theta)}$

4. cot x $\frac{\cos(\theta)}{\sin(\theta)}$

5.9 Trigonometric Identities

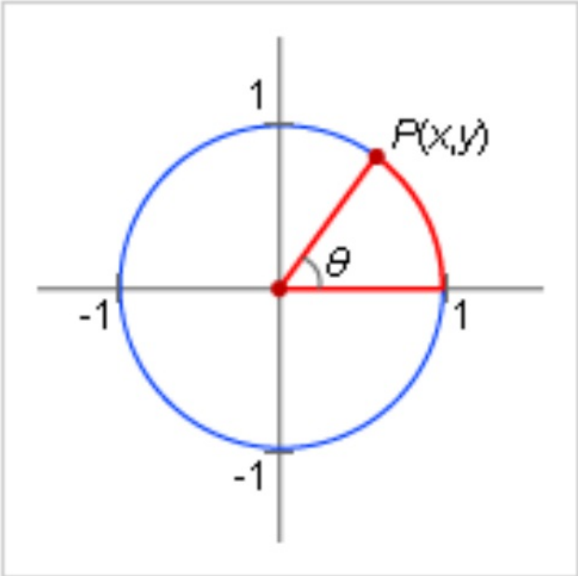
1/08/15

Recall: $D = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$$\sin^2(\theta) + \cos^2(\theta) = 1$$

$$\sin(\theta) = y$$

$$\cos(\theta) = x$$



$\frac{\pi}{4}$ $\left(\frac{1}{\sqrt{2}}, \frac{\sqrt{2}}{2}\right)$ 45°

$\frac{\pi}{3}$ $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ 60°

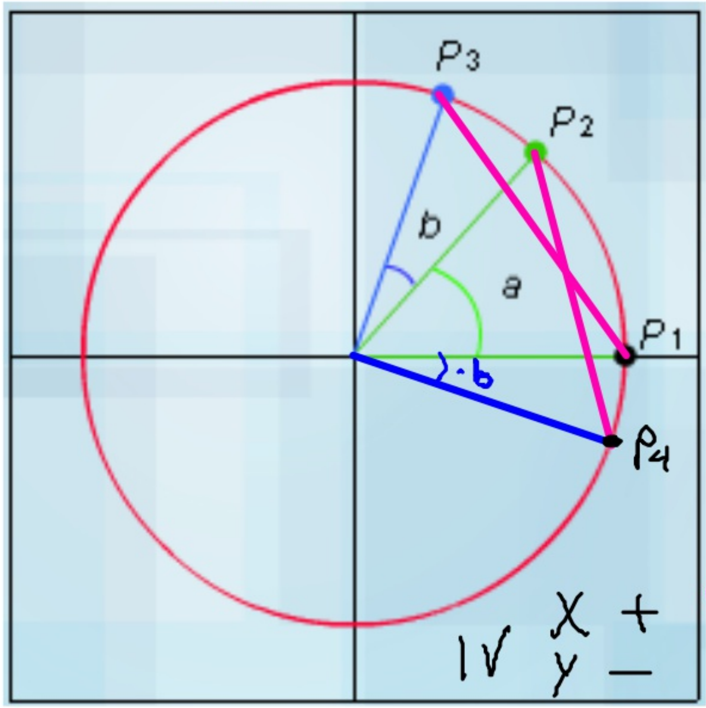
$\frac{\pi}{6}$ $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ 30°

5.9 Trigonometric Identities 1/08/15

Derive and use the trigonometric sum and difference identities.

5.9 Trigonometric Identities 1/08/15

Trigonometric Sum Identity



$(\cos(a+b), \sin(a+b))$

$(\cos(a), \sin(a))$

$d(p_1 p_3) = \sqrt{(\cos(a+b)-1)^2 + (\sin(a+b)-0)^2}$

$(1,0)$

$(\cos(b), -\sin(b))$

$d(p_2 p_4) = \sqrt{(\cos(a)-\cos(b))^2 + (\sin(a)+\sin(b))^2}$

5.9 Trigonometric Identities 1/08/15

Trigonometric Sum Identity

$$\sqrt{(\cos(a+b)-1)^2 + (\sin(a+b)-0)^2}^{\,2} = \sqrt{(\cos a - \cos b)^2 + (\sin a - (-\sin b))^2}^{\,2}$$

$$(\cos(a+b)-1)^2 + (\sin(a+b))^2 = \underline{(\cos(a)-\cos(b))^2 + (\sin(a)+\sin(b))^2}$$

$$\cos^2(a+b) - \cos(a+b) - \cos(a+b) + 1$$

$$\cos^2(a+b) - 2\cos(a+b) + 1 + \sin^2(a+b)$$

$$\sin^2(a+b) + \cos^2(a+b) - 2\cos(a+b) + 1 = 2 - 2\cos(a+b)$$

$$\cos^2(a) - \cos(a)\cos(b) - \cos(a)\cos(b) + \cos^2(b) + \cdots$$

$$\underline{\cos^2(a)} - 2\cos(a)\cos(b) + \cos^2(b) + \underline{\sin^2(a)} + \sin^2(b) + 2\sin(a)\sin(b)$$

$$1 - 2\cos(a)\cos(b) + \underline{\cos^2(b)} \underline{+ \sin^2(b)} + 2\sin(a)\sin(b)$$

$$2 - 2\cos(a)\cos(b) + 2\sin(a)\sin(b) = 2 - 2\cos(a+b)$$

$$1 - \cos(a)\cos(b) + \sin(a)\sin(b) = 1 - \cos(a+b)$$

$$+\cos(a)\cos(b) \cancel{+} - \sin(a)\sin(b) = +\cos(a+b)$$

5.9 Trigonometric Identities 1/08/15

IWBAT

- Derive and use the double-angle identities.
- Derive and use the squared identities.
- Derive and use the half-angle identities.
- Derive and use the product-to-sum identities.

I will capture my thinking using the math note catcher including teacher and student-team modeled example problems on the Promethean board. I will demonstrate my understanding on my exit ticket.

5.9 Trigonometric Identities 1/08/15

Trigonometric Identity Reference

$$\cos(a+b) = \cos a \cos b - \sin a \sin b$$

$$\cos(a-b) = \cos a \cos b + \sin a \sin b$$

$$\cos\left(\frac{\pi}{2} - x\right) = \sin x$$

$$\sin(a+b) = \sin a \cos b + \cos a \sin b$$

$$\sin(a-b) = \sin a \cos b - \cos a \sin b$$

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x$$

$$\tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \tan b}$$

$$\tan(a-b) = \frac{\tan a - \tan b}{1 + \tan a \tan b}$$

IWBAT derive and use the double-angle identities, derive and use the squared identities, derive and use the half-angle identities, and derive and use the product-to-sum identities.

5.9 Trigonometric Identities 1/08/15

Double-Angle Identities

$$\cos 2x = \cos^2 x - \sin^2 x$$
$$= 1 - 2\sin^2 x$$
$$= 2\cos^2 x - 1$$
$$\sin 2x = 2\sin x \cos x$$
$$\tan 2x = \frac{2\tan x}{1 - \tan^2 x}$$

Squared Identities

$$\sin^2 x = \frac{1-\cos 2x}{2}$$

$$\cos^2 x = \frac{1+\cos 2x}{2}$$

Product-to-Sum Identities

$$\cos a \cos b = \frac{1}{2}\left(\cos(a-b) + \cos(a+b)\right)$$

$$\sin a \sin b = \frac{1}{2}\left(\cos(a-b) - \cos(a+b)\right)$$

$$\sin a \cos b = \frac{1}{2}\left(\sin(a+b) + \sin(a-b)\right)$$

$$\cos a \sin b = \frac{1}{2}\left(\sin(a+b) - \sin(a-b)\right)$$

Half-angle Identies

$$\sin\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{2}}$$

$$\cos\frac{x}{2} = \pm\sqrt{\frac{1+\sin x}{2}}$$

IWBAT derive and use the double-angle identities, derive and use the squared identities, derive and use the half-angle identities, and derive and use the product-to-sum identities.

5.9 Trigonometric Identities 1/08/15

Exit Ticket

Solve for the exact value of cos(75°).

$$\cos(a+b) = \cos(\underset{a}{45}+\underset{b}{30})$$

$$\cos(a+b) = \cos(a)\cos(b) - \sin(a)\sin(b)$$

$$\cos(45)\cos(30) - \sin(45)\sin(30)$$

$$\left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)$$

$$\frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4} = \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$\frac{\sqrt{2}\cdot\sqrt{3}}{4} \qquad \frac{\sqrt{2}}{4}(\sqrt{3}-1)$$

IWBAT derive and use the double-angle identities, derive and use the squared identities, derive and use the half-angle identities, and derive and use the product-to-sum identities.

5.9 Trigonometric Identities 1/08/15

Vocabulary Appendix A.2
Practice 5.9.2

IWBAT derive and use the double-angle identities, derive and use the squared identities, derive and use the half-angle identities, and derive and use the product-to-sum identities.